PUBLIC WORKS

Feb. 1952

CITY, COUNTY AND STATE

How Machines Improve Highway Maintenance

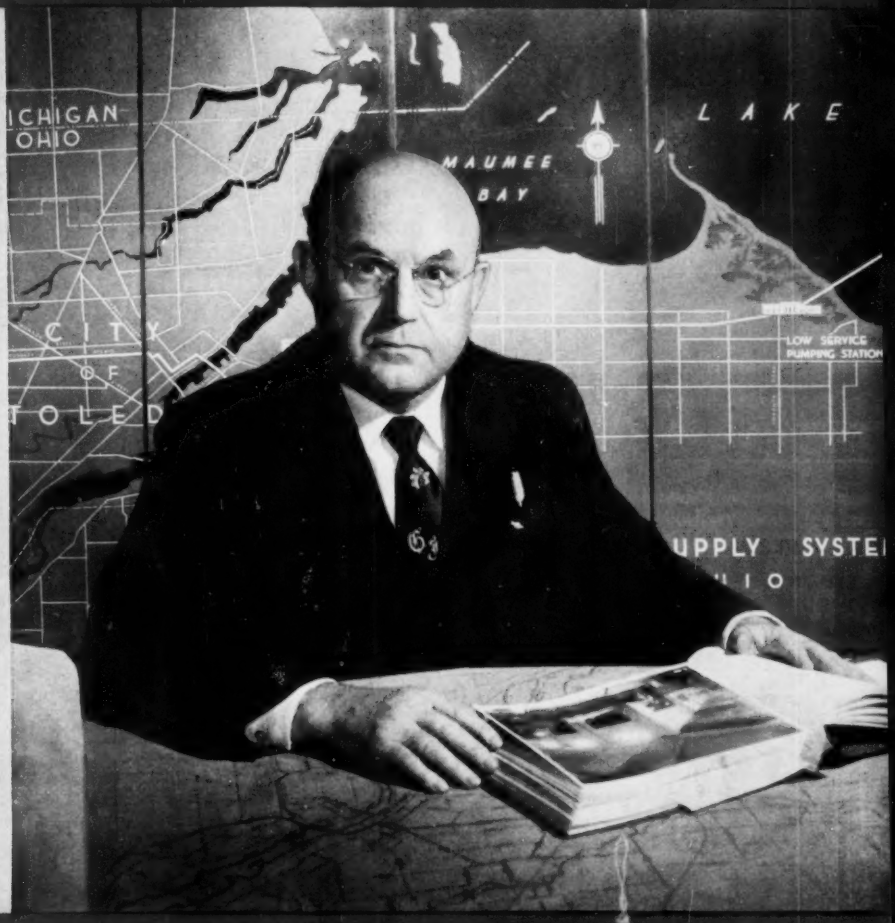
Specs for Filter Stone and Underdrains

Forecast: Snow— NYC Operations

Chlorination for Better Swimming Pool Operation

Subdivision Sanitation in Rural Areas

Gasoline Engines for Standby Service



George J. Van Dorp, Commissioner of Water, Toledo, Ohio, who will direct a $7.5 million program for improved water distribution and installation of a softening plant for that city. More on page 24.

Make Budgets and Manpower GO FARTHER

with a HUBER MAINTAINER

There isn't a highway or street maintenance problem in the nation that more dollars and more men wouldn't cure.

If either of these limitations is pinching you, don't overlook a few important facts about the Huber Maintainer:

1 It's a 6,000 lb., 42½ H. P. grader with attachments that convert it to a bulldozer, lift loader, mower, broom, snow plow, berm leveler, road planer or patch roller.

2 Its variety of uses keeps it busy every month of the year.

3 It gets around without haulage equipment—covers up to 100 miles in a day.

4 It costs less than half as much as many pieces of maintenance equipment.

5 It needs only ONE MAN to perform its many jobs.

See your nearest Huber Distributor — get an order placed today.

HUBER MANUFACTURING CO. • Marion, Ohio, U. S. A.

Manufacturers of Huber Maintainers, Graders and Complete Line of Rollers

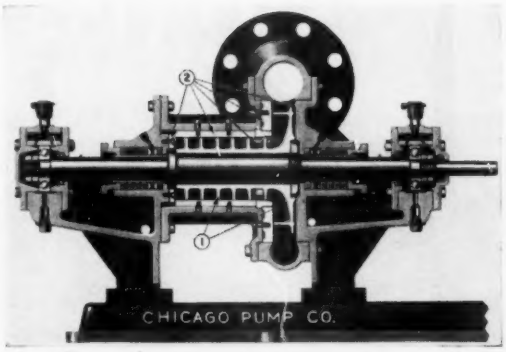
HUBER

Chicago Pumps for Sewage and Sludge

SCRU-PELLER SLUDGE PUMPS

The Scru-Peller Pump was specifically designed to handle sludge. Coarse stringy material is cut and cannot wrap or bind the impellers.

1. **SCREW and IMPELLER** are keyed on the shaft and held firmly against a shoulder on the shaft by a nut. The screw has two flights; and the impeller has two blades. Each flight in the conveyor connects directly with its own blade of the impeller.
2. **CUTTING EDGES.** There are four stellited cutting bars and a shear ring in the screw housing. There are four more cutting bars in the pump casing. The stellited edges of the screw and the edges of the impeller blades act against the cutting bars and shear ring, completely chopping all coarse solid material into small pieces that cannot clog or slow the pump.



FLUSH-KLEEN EJECTORS

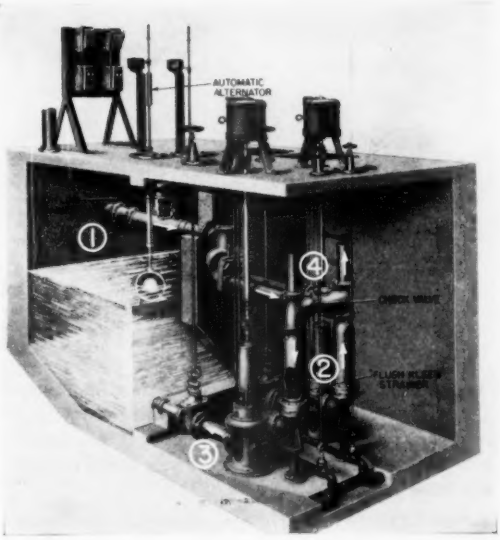
FLUSH KLEEN pumps provide automatic, trouble-free service in sewage lift-stations. They require no manual attention except periodic lubrication and inspection. No labor is required for disassembling and cleaning clogged pumps. FLUSH KLEENS are absolutely clog proof. The impellers handle nothing but strained sewage, minimizing wear and maintaining pump balance. They are the only absolutely clog proof sewage pump. The FLUSH KLEEN will pump anything that will pass through the pipe regardless of type or quantity of material.

FILLING WET WELL

1. Sewage flows through inlet pipe.
2. Coarse matter is retained on strainer.
3. Strained sewage flows through idle pump to wet well.

PUMPING

3. Strained sewage is pumped from wet well.
2. Coarse matter is backwashed from strainer.
4. Special check valve closes; sewage and coarse matter are pumped to sewers.

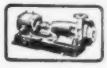


CHICAGO SEWAGE EQUIPMENT

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2300 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**



Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers, Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

Get the Drift?

SOME SHOVELING—and when a blizzard ties up traffic, it takes shoveling like this to get cars and buses going again. That's an International TD-9 crawler doing the work.

They do in Columbus...with a tough little International TD-9

Thanksgiving Day last winter brought Columbus, Ohio, a paralyzing blizzard that stopped normal living completely till strong men and machines like this International TD-9 crawler dug the city out from under.

The TD-9 is one of a complete line of rugged International crawlers. Size for size, each model has the sheer dogged power and the easy-handling maneuverability to move more snow in less time. And with International's exclusive starting system, they all get going fast even in zero weather.

For the inside information on how International power can serve your community and help you get more work done for every tax dollar spent, check with the International Industrial Distributor in your area. Check, too, on his service facilities. Get the whole low-down . . . and get International *"Power that Pays!"*

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

POWER THAT PAYS — INTERNATIONAL HARVESTER — **INTERNATIONAL**

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W. A. Hardenbergh

Assistant Editor
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Editorial Assistant
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Contributing Editor
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Advertising Manager
Arthur K. Akers

Production Supervisor
I. James Barger

Circulation Supervisor
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Advertising Offices
New York 17, 310 East 45th St.
Arthur K. Akers, Adv. Mgr.
Burton M. Yost

Chicago 11, Ill.
612 N. Michigan Ave.
Lewis C. Morris, Western Mgr.

Cleveland 10, Ohio, Villa Beach
2, 15445 Lake Shore Blvd.
Robert J. Shea, Mgr.

Los Angeles 14, Calif.,
Halliburton Bldg., Suite 31
Simpson-Reilly, Ltd.

San Francisco 3, Calif.
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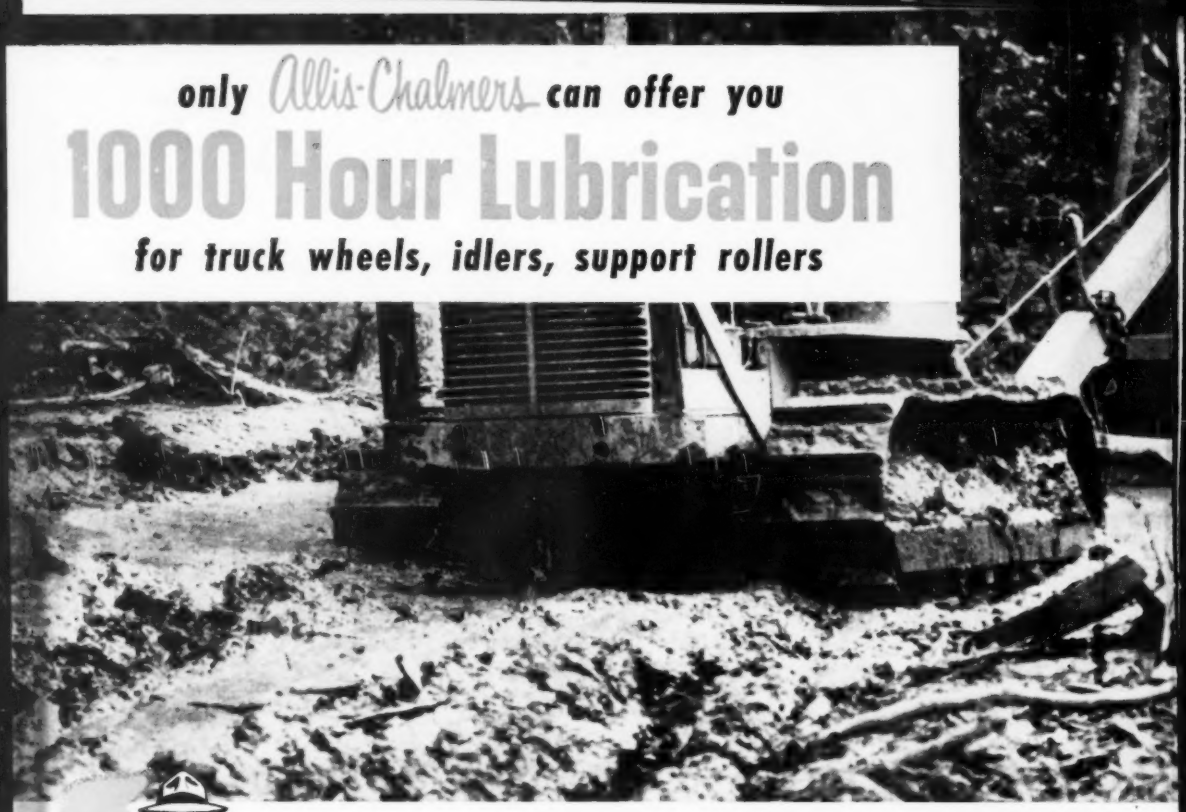
The 1952 volume of Public Works will be available on microfilm through University Microfilms, 313 N. First St., Ann Arbor, Mich.

THE ENGINEERING AUTHORITY
IN THE CITY-COUNTY-STATE FIELD

only Allis-Chalmers can offer you

1000 Hour Lubrication

for truck wheels, idlers, support rollers



FULL PROTECTION—only One Greasing Every 1000 Hours—with Allis-Chalmers *Exclusive* Positive Seal, Roller Bearing Design

Think of it! You can operate for 6 months on a 40-hour-week basis with just one lubrication of 14 to 20 of the most-abused, hardest-to-service points on a tractor. It's possible through an exclusive combination of glass-smooth Positive Seals and anti-friction bearings that help you do more work at lower cost even under toughest conditions! And it's another ahead-of-the-field design feature found only in the four new Allis-Chalmers tractors.

These Big Benefits Mean DOLLARS to you!

DAILY GREASING PERIODS ELIMINATED. You save at least 30 minutes every day . . . gain about one full month's production every year.

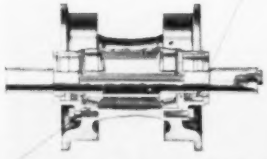
FULL PROTECTION ASSURED. Positive Seals keep grease in . . . dirt and moisture out. 1000-Hour Lubrication gives you protection unchallenged in the tractor field.

SAVES ON GREASE. Truck wheels, idlers and support rollers are grease-filled at the factory . . . need new grease only once every 1000 hours!

EASY TO SERVICE. No more cleaning of dirt, muck and grime from fittings every day. Operator can choose time and place to regrease when conditions are favorable.

Here's the secret:

Positive Seals ground smooth as glass, seal the grease in...keep dirt, grit, dust, mud and water *out*.



Tapered Roller Bearings protect the Positive Seals by letting truck wheels, idlers and support rollers rotate freely . . . without side thrust or wobble.

ALLIS-CHALMERS

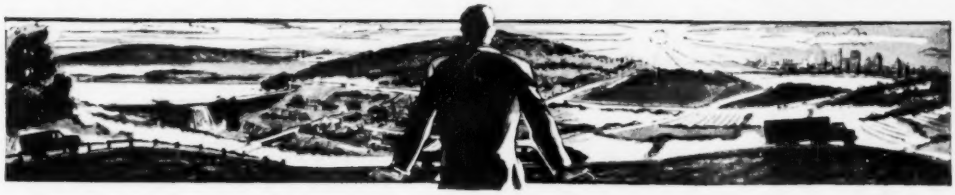
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

the newest, finest tractor line on Earth!

HD-20 • HD-15 • HD-9 • HD-5

DESIGNED FOR YOUR JOB • BUILT TO TAKE IT • EASY TO OPERATE • EASY TO SERVICE

THE EDITOR'S POINT OF VIEW



There's Some Queer Thinking on Gas Tax Diversion

A NEW JERSEY newspaper cites the Governor of that state as being in favor of diversion of highway user revenues, collected from motor vehicle fees and the gasoline tax, for the queer reason that "even if all of the highway revenue were used for roadbuilding, there wouldn't be enough." At this time, such highway user collections are running about $80,000,000 a year in New Jersey and $29,000,000 are being diverted for other purposes.

There seems to be little doubt of the willingness of motorists to pay tolls on such super-highways as the New Jersey Turnpike, the Pennsylvania Turnpike, and others. It appears, moreover, that the tolls will readily pay for interest, amortization and operation of these magnificent highways. We should build more of them; but we should not use their construction as a blind behind which the other revenues collected from motorists are dissipated in activities totally foreign to highway construction and maintenance.

Annual Reports Up to Date

IN welcome contrast to most annual reports, which have a tendency to reach our office from nine to twelve months late, is the 1951 Annual Report on Georgia Water Pollution Control. This report reached this office on January 4. Congratulations to William H. Weir, Director of Water Pollution Control for his usual promptness and efficiency.

We are always glad to have annual reports, even if they do reach us late. We hope that our readers will see that we are on their mailing lists.

How to Produce More Scrap and Make Money Doing It

ONE of the things that this country needs right now for its defense effort is more scrap metal. Cities, counties and states can furnish plenty of that scrap if they will scrap a lot of antiquated and out-dated equipment. Right here in New York City, streets are being repaired with steam rollers that must be all of 40 years old; and this is no outstanding exception. No doubt there is other equipment in New York and in almost every other city, not to mention counties and states, that is just as costly to own and operate, and that slows the pace of operation, construction or maintenance to what might have been satisfactory when labor cost 40 cents an hour.

Modern maintenance and construction equipment will save money. It does this by doing the work faster, by doing it with less manpower, and by doing it better. Many articles we are publishing in this magazine ought to be required reading for governmental officials. These articles show how work is being done better, faster and cheaper by using up-to-date equipment, whether it is work for cities, counties, states or the Federal Government.

Contractors are not given to such use of outmoded equipment; and there is a very good reason: The ones who tried to do so have gone out of business because they couldn't compete with those contractors who adopted modern equipment. But a lot of governmental units are still trying to drag themselves along with equipment long overdue for the scrap pile.

Why not help the war effort by turning in such stuff for scrap and help the peoples' pocketbooks by getting more efficient tools?

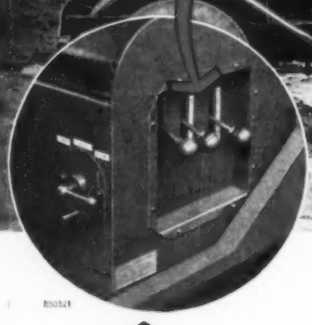
It Doesn't Cost Anything to Ask for What You Need

WHEN a community needs facilities, such as water works, an airport, sewers or a sewage treatment plant, highways or bridges, it should not hesitate to ask for the necessary allotments of critical materials for their construction. There is a certain amount of red tape that must be observed in applying for and obtaining such materials; but they can be obtained.

We do not believe that this is the time to postpone projects that will contribute to better transportation and a reduction in traffic congestion, delays and accidents; that will provide more needed water or safer water; that will reclaim our streams and contribute to health through the reduction in stream pollution; that will contribute needed air transport facilities; and that will help toward better collection and disposal of solid wastes. Some improvements that we would like to have, we can dispense with for a while, but very few of those in the above categories. If your community needs such facilities, don't be afraid to try to get them.

Barber-Greene

Runabout SERVICE DITCHER



The Hydra-Crowd — hydraulic transmission of power to the driving wheels — allows the operator of the Runabout, with a twist of the wrist, to keep it going at top digging efficiency through varying soil conditions.

with HYDRA-CROWD

finger-tip hydraulic control of crowding speed independent of bucket line speed

The Model 705-A Runabout now features the Hydra-Crowd, which provides an infinite range of crowding speeds from 0 to 16 f.p.m., independent of bucket line speed. With its 15 m.p.h. road speed and Vertical Boom milling action — and new Hydra-Crowd control — the Runabout combines mobility and digging efficiency to make possible lowest cost per foot of trench in all digging conditions the year around.

SEND FOR BULLETIN!

Send for *Bulletin* 705-A which describes completely all the advantages you gain when you use a Model 705-A Runabout Service Ditcher.

Outstanding Runabout Performance Features

- Year around operation
- 5½", 7½", 10½" cutting widths down to 48" deep
- 15 m.p.h. road speed
- Control of digging from cab or ground
- Fastest digging in everything from loam to coral rock
- Instant stop—quick reverse
- Digs clean trench—no ramp to be dug by hand
- One-man operation

Barber-Greene, Aurora, Illinois

Now's the time to mail this month's Readers' Service card.

that only

C-P-P*

meets the

BIG 3 REQUIREMENTS

Only Concrete Pressure Pipe meets *all* of the "Big 3" requirements for ideal high pressure water lines. 1. Long life. 2. Sustained high carrying capacity. 3. Great structural strength. Rochester, N. Y. wanted all three for its new 45,000 foot supply line, *because former lines did not meet all three requirements.* So they turned to Price Prestressed Concrete Cylinder Pipe. Here's how they figured.

1. *Long life.* With Price Prestressed Pipe, only *concrete* is exposed. When buried in the ground, concrete is ageless as limestone—life is measured in centuries.

2. *Sustained capacity.* Properly placed concrete has the highest flow coefficient of any pressure pipe structural material—will never corrode or tuberculate under ordinary conditions. The concrete core is there "for good", because it is a structural part of the pipe. Prestressed Pipe offers continued high flow with no maintenance cost.

3. *High beam strength.* Price Prestressed Pipe makes your water line safe from external loads. It is shatterproof—and sudden and complete failure is all but impossible.

Don't overlook the other advantages of Price Pipe. *It's easy to lay*—can be installed quickly and easily because of its simple, self-centering joint. *It's easy to tap*—any service man does the job with regular equipment and a few accessories. *It's watertight*—the rubber and steel flexible joint adjusts to expansion, contraction, vibration and external loads without leaking. *It has great economy*—because of low original cost, low maintenance and extra-long, trouble-free life.

Are your present water lines as ageless as limestone? Do they carry as much water as the day they were installed? Are they free from sudden bursting and resulting floods? If not, learn all about Price Prestressed Pipe—with its steel cylinder plus an encasement of concrete inside and out. Our engineers know pipe line problems. Call them today.

only CONCRETE PRESSURE PIPE MEETS THE BIG 3 REQUIREMENTS

Price Brothers Company

1779 East Monument Avenue, Dayton 1, Ohio

Please send me, without obligation, the following literature:

☐ Rochester's new water supply line

☐ Complete facts on Prestressed Pipe

Name_____

Organization_____

Street_____

City_____ State_____

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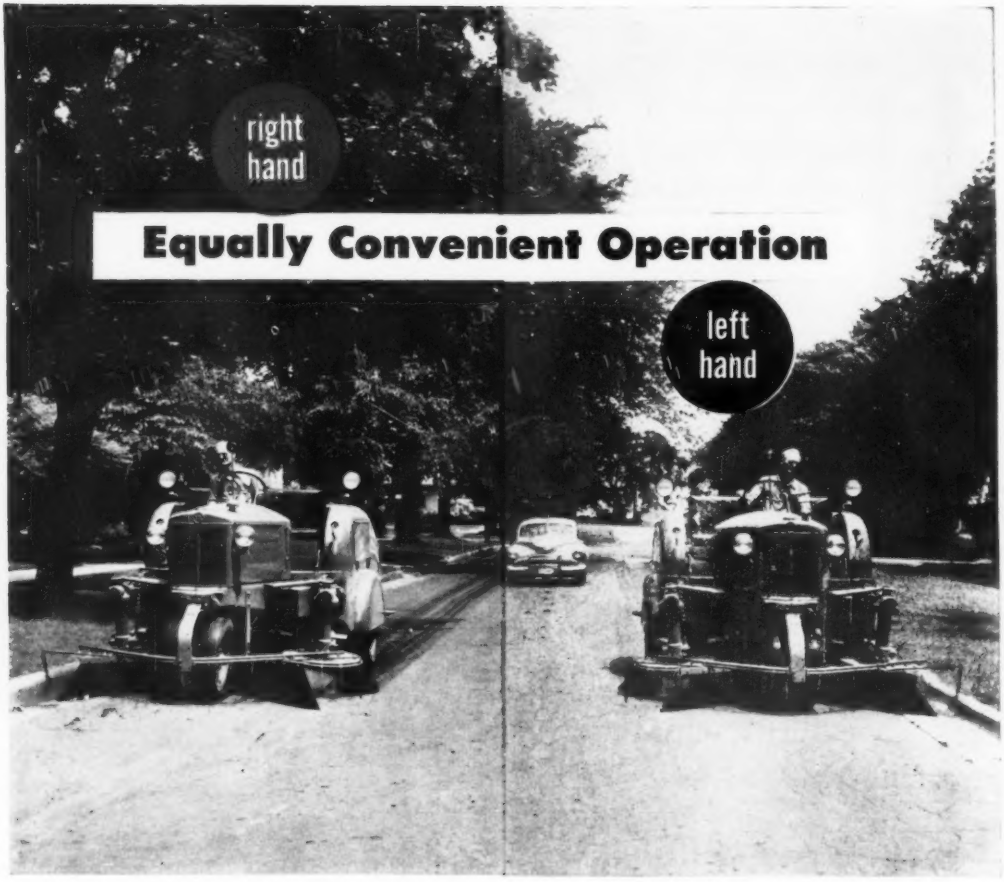


separated pavement—one-way streets—island areas

The Double Gutter Broom Model "40—*is Your Best Buy!*

Best, Because there are no "blind spots." The operator has a perfect view of the gutter broom and the entire street . . . works with maximum efficiency and safety.

Best, Because with a full width seat up front, special driving and steering controls are not needed . . . the operator simply slides over on the seat a bit.

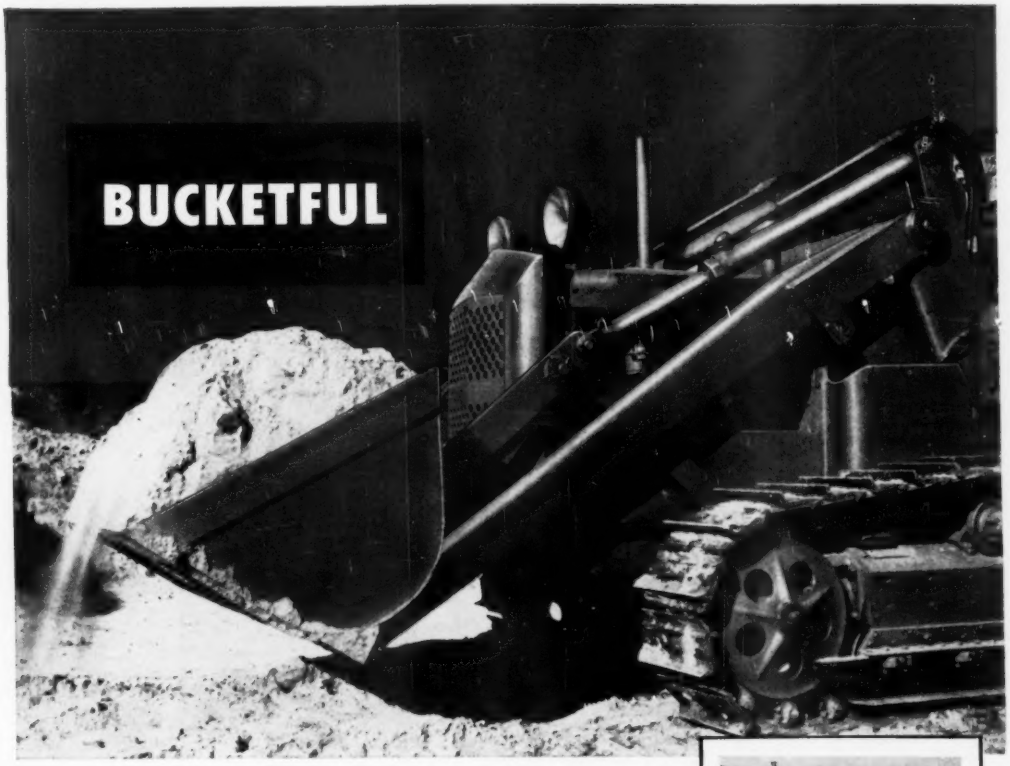
Best, Because the Model "40" can be purchased with a single gutter broom, and a second added later, as the need arises, at very little cost.

AUSTIN-WESTERN COMPANY · Subsidiary of Baldwin-Lima-Hamilton Corporation · AURORA, ILLINOIS, U.S.A.

Austin Western

BALDWIN BLH LIMA-HAMILTON

SINCE 1859—BUILDERS OF CONSTRUCTION EQUIPMENT



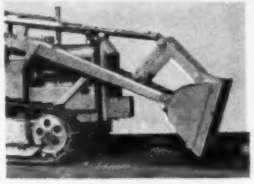
of Cost-Cutting Features

When it comes to cutting loading costs . . . stepping up profits, the Oliver Model "B" Crawler and Ware Loader is "loaded" with *plus* features.

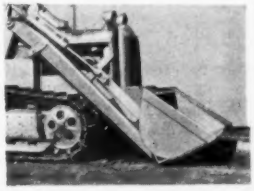
Take the hydraulically controlled bucket, for example. 110° bucket rotation and 28° "tilt back" give you a full bucket every time. "Breaking out" action is 3 times the lifting effort of the loader . . . a particularly important advantage when loading out hard-packed material or for stripping operations. Bucket level is automatically maintained when lifting load, preventing wasteful spillage. You can control speed of discharge . . . fast or slow, easily and gently. And, even with the "tilt back" action, you still have a 32° (from vertical) dump angle . . . a control range no other loader can match. You get bigger loads . . . *faster!*

The Oliver-Ware "B" loader was designed and built exclusively for Oliver Model "B" tractors. Its ideal fit with the tractor eliminates unneeded dead weight and assures maximum stability for the entire unit. The Oliver semi-rigid axle allows limited oscillation of the track, eliminating the possibility of track-frame distortion. A hydraulic shock absorber smooths out pressure surges . . . prevents damage to loader and tractor parts.

For complete information on how the Oliver-Ware Model "B" tractor loader can cut costs for you, see or write your Oliver Industrial Distributor.



Plenty of power, plus the wide angle of bucket rotation, assures faster, more positive digging. 28° "roll back" assures maximum break-out action for a full bucket every time.



THE OLIVER CORPORATION

Industrial Division: 19300 Euclid Avenue, Cleveland 17, Ohio

A complete line of industrial wheel and crawler tractors

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

INTRODUCING..

THE NEW WALLACE & TIERNAN FLUORIDATOR

Series A-635

design features

- Either Volumetric or Loss-of-Weight Control
- Loss-of-Weight Recording (optional)
- Dust-tight Construction
- Special Two-directional Feed Screw
- Large Dissolving Chamber
- Modern Streamlined Appearance
- Wide Feed Range

Special requirements of Fluoridation — primarily, extreme accuracy and dependability — were considered foremost in the design of W&T's new Series A-635 Fluoridator. A selection of models and a wide feed range make this feeder suitable for the application of sodium fluoride or sodium silicofluoride in most communities.

The basic feeder is volumetric with manual control, featuring the new two-directional feed screw for increased accuracy. Built-in scales can be supplied for periodic checking of the weight of chemical in the hopper.

The gravimetric, loss-of-weight, model is controlled from a unique scale beam housed in a dust-tight compartment. Registers indicate the rate of feed and the weight of chemical in the hopper at all times. Loss-of-weight recording is available with the gravimetric feeder to provide a permanent record of fluoridation.

WALLACE & TIERNAN COMPANY, INC.

CHLORINE AND CHEMICAL CONTROL EQUIPMENT

NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES

S-67

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

They saved the day when the regular power failed

Two "Caterpillar" D13000 Engines provide standby power for the Southern Wyoming Utilities water plant in Green River. Each develops 150 horsepower for maximum duty.

In addition to the two "Cat" Diesel Engines housed in this plant as standby power for Green River, Southern Wyoming Utilities employs other D13000s for similar work in other communities.

ONE of the most serious crises that can confront a community is the breakdown of its water supply. Lack of water for drinking, sanitation and fire fighting menaces health and property, so an effective preventive measure against this grim possibility is an invaluable investment.

Consider, for instance, how such a precaution saved the day in Green River, Wyoming. When the regular power failed at the pumping station, there wasn't a moment's break in the water supply. Southern Wyoming Utilities had installed two "Caterpillar" Diesel Engines as standby power, and they instantly took over the pumping job. Both are D13000s, each developing 150 horsepower for maximum duty. One drives a centrifugal pump delivering 1,000 g.p.m. against a 300-foot head. The other drives a vertical turbine pump with a capacity of 1,500 g.p.m. against a 170-foot head. Southern Wyoming Utilities, with headquarters at Rock Springs, uses other "Cat" D13000 Engines on similar work.

Instant response is an important requisite in standby power. Because of their record in emergencies and their economical performance in the long run, "Cat" Diesel Engines and Electric Sets are found in many fields – in utilities, in municipal, county, state and federal departments and in thousands of contracting and industrial concerns. Users have discovered that "Caterpillar" Dealer service is competent and always available. They have also discovered that proper maintenance by their own personnel pays off.

A few minutes' daily care keeps a sturdy "Caterpillar" unit in excellent condition and adds many extra hours to its working life.

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS
MOTOR GRADERS • EARTHMOVING EQUIPMENT

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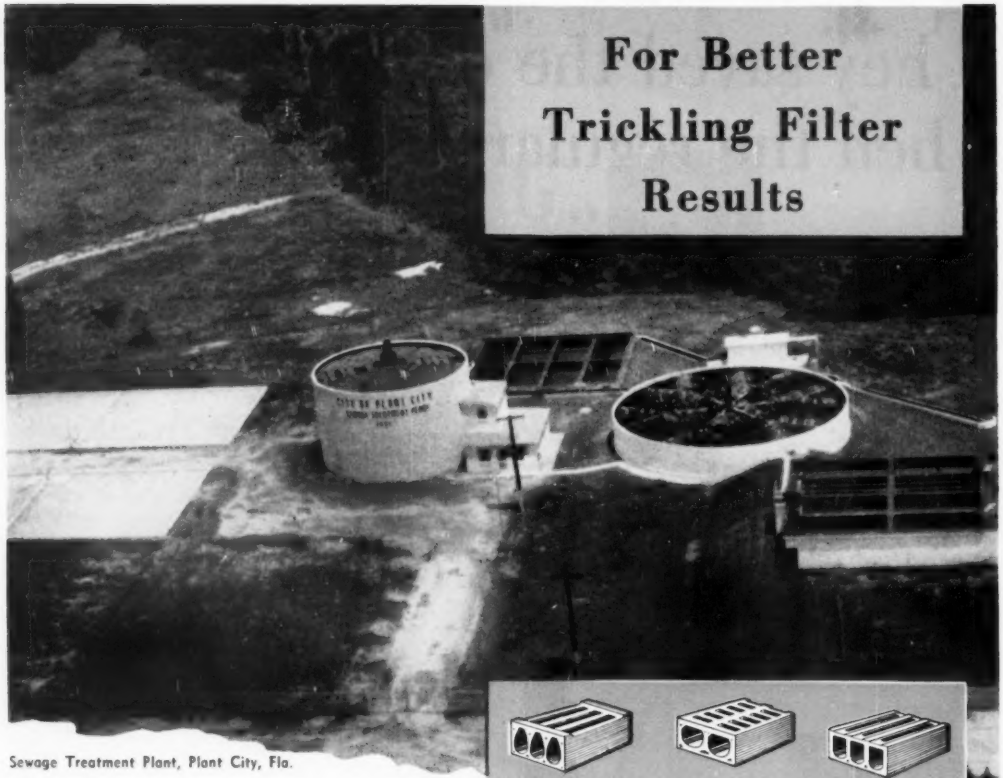
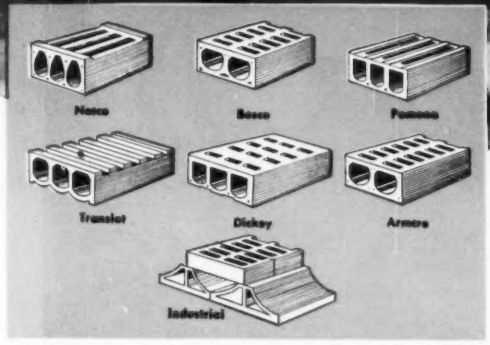
For Better Trickling Filter Results



Sewage Treatment Plant, Plant City, Fla.



Use Good Equipment: Here at Plant City, Florida, Allan B. Pimm specified good equipment throughout. In addition to a 68-ft. Yeomans Aerofilter distributor it includes 4 Yeomans dual Streamline Sludge Collectors; a Yeomans digester with floating cover; and 8 Yeomans sewage pumps.

And to insure best operating results the Plant City filter has a *specification* floor of *Vitrified Clay Filter Bottom Blocks* . . . the best kind of filter floor available.

Use TFF Institute *Specification* Underdrains. The scientific design of these *vitrified clay filter bottom blocks* insures trouble-free operation for the life of the filter. They have large top openings. That means proper ventilation of all filter media and free discharge of the filter effluent at all times. They have smooth run-off channels. That means quick drainage and no clogging. The blocks are light in weight, self-aligning and easy for unskilled labor to lay. After they have been laid they are strong enough to work on and to support even very deep filter media.

These modern underdrain blocks will carry applications up to 50 MGAD. They are best for all kinds and shapes of filters. They are used everywhere better operating results are desired.

Use them to insure best results from your next trickling filter. Give it a *specification* floor. Use TFFI *vitrified clay filter bottom blocks*. For full engineering details write any member of this Institute today.

TRICKLING FILTER FLOOR INSTITUTE

W. S. Dickey Clay Mfg. Co., Kansas City 6, Mo. — Ayer-McCarel-Regan Clay Co., Brazil, Ind. — Bowerston Shale Co., Bowerston, Ohio — Industrial Materials Co., Philadelphia 34, Pa.
Texas Vitrified Pipe Co., Mineral Wells, Tex. — National Fireproofing Co., Pittsburgh 22, Pa. — Pomona Terra-Cotta Co., Pomona, N. C.

For more details on products in this ad circle No. 20 on Readers' Service card

. . . for every public works construction or maintenance job, specify DAVEY

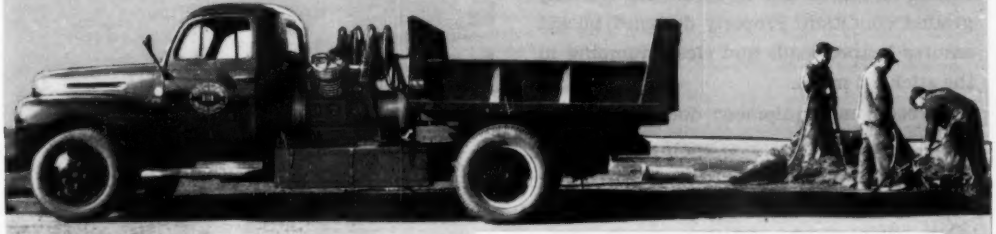
On important public works jobs throughout the country, you'll always find Davey Compressors.

Davey portable trailers are available in 60-105-160-210-315 c.f.m. capacities. "Auto-Airs" (in the same capacities) are suitable for mounting on all standard motor trucks and are driven direct from truck engines through Davey Heavy Duty Power Take-offs. And—there are many other Daveys of various types to meet your every compressed air need.

A-4393

Davey Model 315 Diesel trailer on U. S. Army construction project.

Davey Model 105 trailer used for construction and maintenance work by Wayne County General Hospital, Eloise, Michigan.



Model 105 "Auto-Air" in service of Akron (Ohio) Water Department. Note how "Auto-Air" occupies only 1/3 of truck, leaving remainder open for transportation of men, tools and materials.

DAVEY

pioneers of "air-cooled air"

DAVEY COMPRESSOR CO. • KENT, OHIO

Need more facts about advertised products? Mail your Readers' Service card now.

Anytime

TRAXCAVATORS ARE YEAR 'ROUND TAX SAVERS

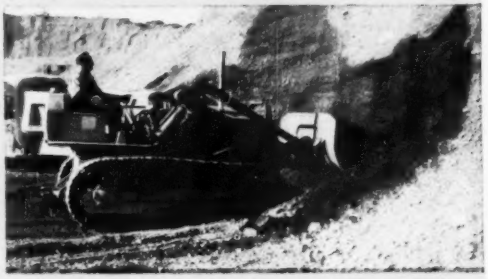
Hard-packed snow *gives way to* **TRAXCAVATOR** *power as an HT4 clears the streets of Cincinnati. The full buckets are quickly raised to heap-load big hauling units.*

NO WORRY about winter storage for your **TRAXCAVATORS**—these versatile work-giants are on the job the year around.

When the snow flies, the **TRAXCAVATOR'S** sure-footed traction gets heaped bucket loads of packed snow or loose drifts . . . quickly making streets safe for traffic. **TRAXCAVATORS** efficiently convert "Caterpillar" Diesel Tractor power into digging force to break loose frozen sand, cinders and gravel for ice control.

Spring muds fail to dampen **TRAXCAVATOR** activity. "Caterpillar" track-type traction carries its tractor-shovel teammate over any ground condition. Properly designed bucket assures heaped loads and clean dumping in the stickiest muds.

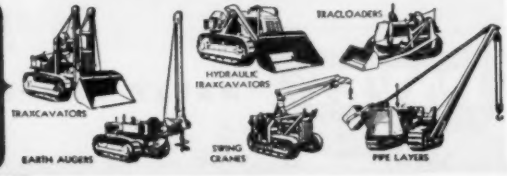
Spread your equipment dollars throughout the year . . . over the many jobs that a one-man **TRAXCAVATOR** crew can do quickly and economically. Your TRACKSON-"Caterpillar" Dealer will give you the complete **TRAXCAVATOR** story . . . or write **TRACKSON COMPANY, Dept. PW-101, Milwaukee 1, Wisconsin.**

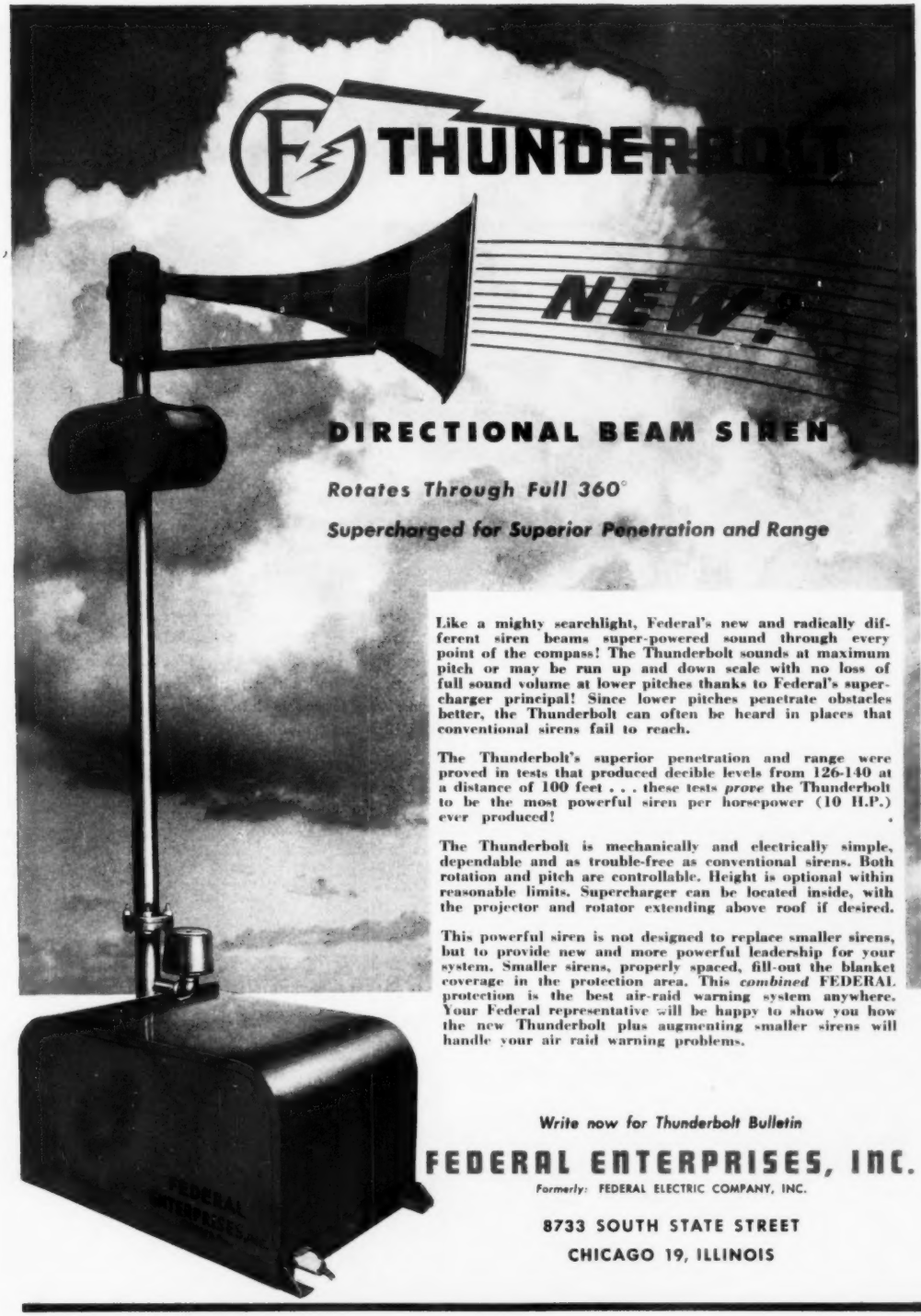


Loading material *for ice control requires the digging ability of a* **TRAXCAVATOR.** *This hydraulically-operated HT4 works for a sand and gravel contractor in Washington.*

Mud—foe of any machine—is *"duck soup" for* **TRAXCAVATORS.** *Matched design, balance, traction, and ease of operation carry this HT4 through deep mud on a street repair job in Great Falls, Montana.*

TRACKSON
TRACTOR EQUIPMENT





Like a mighty searchlight, Federal's new and radically different siren beams super-powered sound through every point of the compass! The Thunderbolt sounds at maximum pitch or may be run up and down scale with no loss of full sound volume at lower pitches thanks to Federal's supercharger principal! Since lower pitches penetrate obstacles better, the Thunderbolt can often be heard in places that conventional sirens fail to reach.

The Thunderbolt's superior penetration and range were proved in tests that produced decible levels from 126-140 at a distance of 100 feet . . . these tests *prove* the Thunderbolt to be the most powerful siren per horsepower (10 H.P.) ever produced!

The Thunderbolt is mechanically and electrically simple, dependable and as trouble-free as conventional sirens. Both rotation and pitch are controllable. Height is optional within reasonable limits. Supercharger can be located inside, with the projector and rotator extending above roof if desired.

This powerful siren is not designed to replace smaller sirens, but to provide new and more powerful leadership for your system. Smaller sirens, properly spaced, fill-out the blanket coverage in the protection area. This *combined* FEDERAL protection is the best air-raid warning system anywhere. Your Federal representative will be happy to show you how the new Thunderbolt plus augmenting smaller sirens will handle your air raid warning problems.

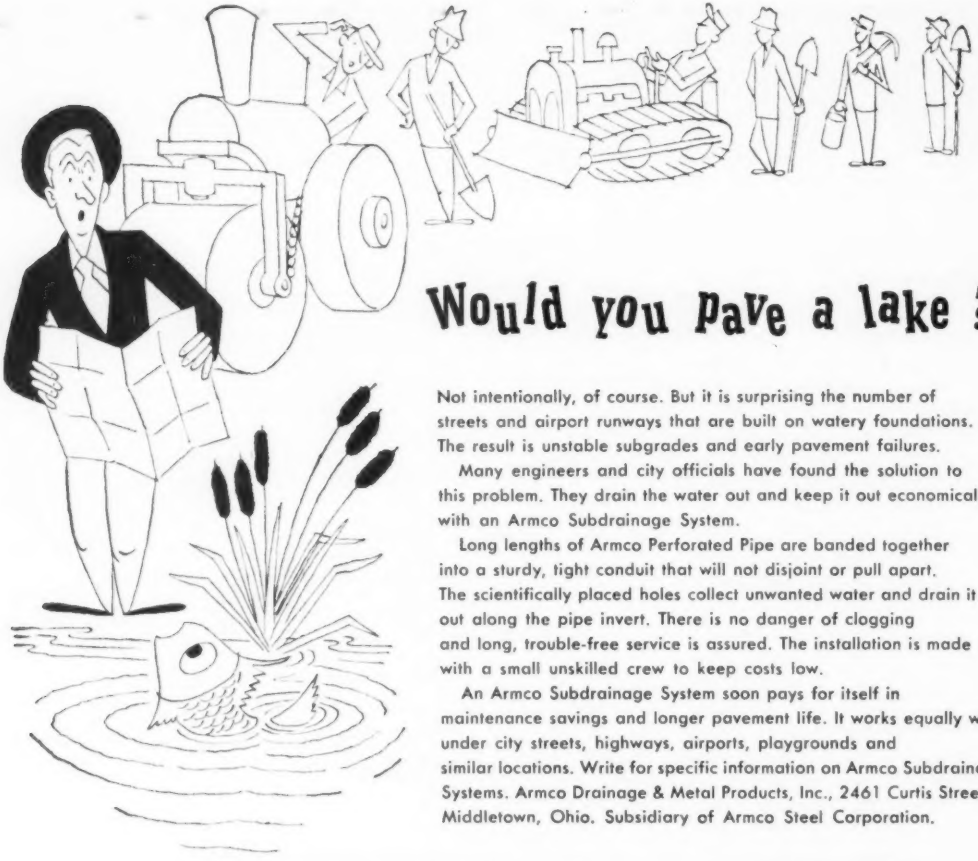
Write now for Thunderbolt Bulletin

FEDERAL ENTERPRISES, INC.

Formerly: FEDERAL ELECTRIC COMPANY, INC.

8733 SOUTH STATE STREET
CHICAGO 19, ILLINOIS

Get full details of this month's new products . . . mail your Readers' Service card today.



Would you pave a lake ?

Not intentionally, of course. But it is surprising the number of streets and airport runways that are built on watery foundations. The result is unstable subgrades and early pavement failures.

Many engineers and city officials have found the solution to this problem. They drain the water out and keep it out economically with an Armco Subdrainage System.

Long lengths of Armco Perforated Pipe are banded together into a sturdy, tight conduit that will not disjoint or pull apart. The scientifically placed holes collect unwanted water and drain it out along the pipe invert. There is no danger of clogging and long, trouble-free service is assured. The installation is made with a small unskilled crew to keep costs low.

An Armco Subdrainage System soon pays for itself in maintenance savings and longer pavement life. It works equally well under city streets, highways, airports, playgrounds and similar locations. Write for specific information on Armco Subdrainage Systems. Armco Drainage & Metal Products, Inc., 2461 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation.

Now's the time to mail this month's Readers' Service card.

Dynamic Separation saves Money

INFILCO
• BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1934 •

OFFERED ONLY BY THE

Accelator®

IN ECONOMICAL WATER TREATMENT, an Accelator occupies but a fraction of the space of an "old-style" treatment plant because it is a single unit . . . because it eliminates the previous multiple steps of mixing, sedimentation and coagulation. The unique dynamic separation principle of operation

(continue to next page)

(from preceding page)

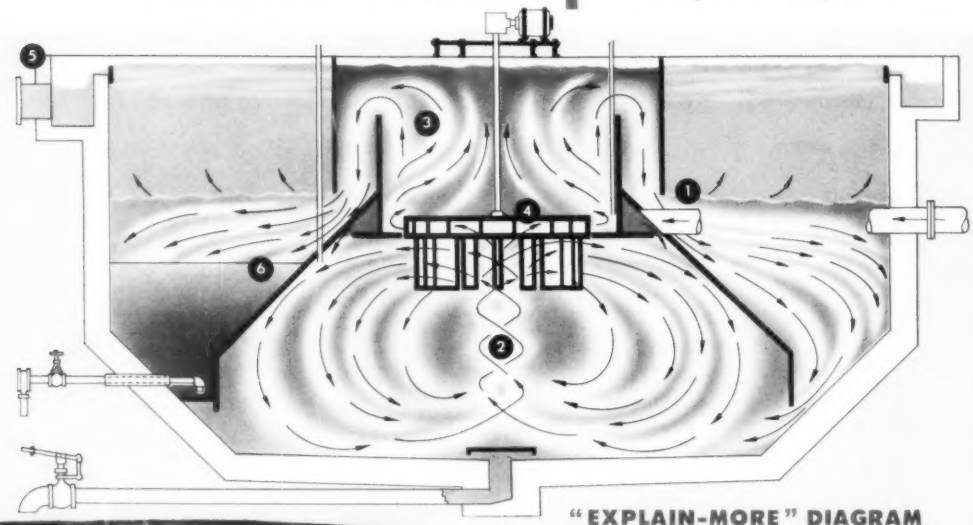
INFILCO
BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1934

permits the treated water to separate from the top of a downward-moving pool of uniformly sized slurry in contrast to having the treated water filter upward through a suspension of sludge of gradually decreasing particle sizes.

INFILCO INC. ★ *Tucson, Arizona*

Outstanding advantages—based on more than two thousand Accelator efficiency-of-operation reports:

- ★ Faster separation of solids from treated water
- ★ Low-velocity movement of tremendous quantities prevents floc break-up
- ★ Rapid mixing of incoming water and chemically impregnated slurry
- ★ Small or large flows have complete contact with slurry
- ★ Thickened sludge is automatically drawn off
- ★ Settling-out of solids is prevented

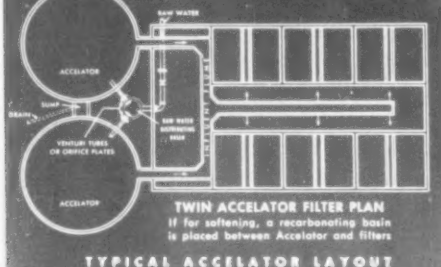


"EXPLAIN-MORE" DIAGRAM

the Accelator basin contains:

1. **A raw water inlet and distributing duct**
2. **A primary mixing and reaction zone**
3. **Two concentric draft tubes which form the secondary mixing and reaction zone**
4. **A rotor-impeller for mixing and pumping, driven by a motorized reducer**
5. **An effluent launder system**
6. **Concentrators to accumulate and remove excess slurry**

PLAN OF ACCELATOR



TWIN ACCELATOR FILTER PLAN
If for softening, a recarbonating basin is placed between Accelator and filters

TYPICAL ACCELATOR LAYOUT

SUGGESTED ACCELATOR APPLICATIONS / POSSIBLE TREATMENT REQUIREMENTS → / WATER END-USE	SOFTENING	CLARIFICATION	STABILIZATION	ALKALINITY REDUCTION	ORGANIC MATTER REMOVAL	TASTE AND ODOR REMOVAL	COLOR REMOVAL	IRON REMOVAL	SILICA REDUCTION	NEUTRALIZATION
MUNICIPAL	X	X		X	X	X	X	X		
PULP	X	X		X	X		X	X		
PAPER	X	X		X	X		X	X		
BEVERAGES		X		X	X	X	X	X		
COOLANT	X	X	X	X	X			X		
BOILER FEED	X	X		X	X		X	X	X	
RAILROADS	X	X					X			
TEXTILE	X	X			X		X	X		
CANNERIES		X		X	X	X		X		
BREWERIES		X		X	X	X	X	X		
OIL FIELD FLOODING		X	X		X		X	X		
BRINE DISPOSAL		X	X		X		X	X		
INDUSTRIAL WASTES DISPOSAL AND REFUSE		X	X		X		X			X

New York's City Hall, completed in 1811, as it looked 100 years ago

The City of New York has several cast iron water mains in service that were laid more than a century ago. They are part of approximately 5,000 miles of cast iron mains representing about 98% of all the pipe in New York's distribution system. The contrast in traffic and construction, above and underground, today and 100 years ago, is fantastic. Yet the shock-strength, crushing-strength and beam-strength of cast iron mains have enabled them to withstand the unforeseen stresses imposed by vast changes. Because of these strength factors and effective resistance to corrosion, cast iron water and gas mains laid over 100 years ago, are still serving in the streets of 38 cities in the United States and Canada.

United States Pipe and Foundry Company, General Offices, Burlington, N. J. Plants and Sales Offices Throughout the U. S. A.

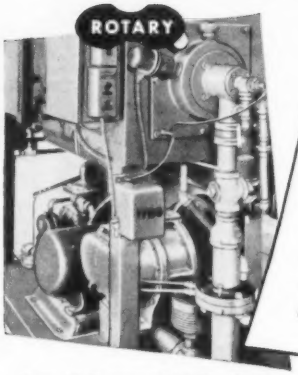
U.S. cast iron PIPE

FOR WATER, GAS, SEWERAGE AND INDUSTRIAL SERVICE

NUMBER TEN OF A SERIES

Get full details of this month's new products . . . mail your Readers' Service card today.

No more "off the cuff" decisions when you compare blower values



- ☐ Choice of Rotary or Centrifugal
- ☐ Capacity matched to the job
- ☐ Easy accessibility
- ☐ Ruggedness
- ☐ Ease of installation
- ☐ Ability to handle overloads
- ☐ Long-time durability
- ☐ Freedom from breakdowns
- ☐ Low maintenance costs
- ☐ Engineering assistance
- ☐ Proved reputation of maker
- ☐ Customer satisfaction

Type AF Blower and XA Gas Pump for CO_2 producer unit at a municipal water works.

If you are considering new equipment for handling gas or air, we suggest you examine the essential values listed above, before you make your final selection. These factors will help you determine the unit that will best match your specific application, and that will give you the most satisfactory, economical performance.

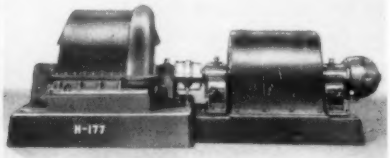
You'll find that R-C equipment rates high in every one of these essential factors. With capacities ranging from 10 cfm to 100,000 cfm or higher, at moderate pressures, and with the exclusive *dual-ability* line of Centrifugal or Rotary Positive types, you have a wide choice to meet the most exacting needs.

If you'd like to tell us about your specific problem, we'll gladly send detailed information for comparison, or supply engineering help from our 98 years of blower building experience.

ROOTS-CONNERSVILLE BLOWER CORPORATION
522 Poplar Avenue, Connersville, Indiana

CENTRIFUGAL

One of three Type H Centrifugal Blowers in sewage treatment plant service. Capacity 15,000 cfm.



Reg. U. S. Pat. Off.

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

Get full details of this month's new products . . . mail your Readers' Service card today.

BOOKS IN BRIEF

HYDRAULIC RESEARCH

This is a guide to current and completed projects conducted by the various hydraulic and hydrologic laboratories in the US and Canada, covering work done at 66 private or state laboratories, 34 Federal and 5 Canadian. The work listed covers nearly 200 subjects. The various projects are indexed. Other material includes a list of committees working in this field and a list of foreign publications and translations available on loans. Edited by Helen K. Middleton and Sonya W. Matchett, National Bureau of Standards, Misc. Pub. 201, 190 pages. $1.25 from Gov't. Printing Office.

ALUMINUM HISTORY

This is a history of the development of aluminum and the Aluminum Co. of America—Alcoa. Written by Charles C. Carr, of the company, it is interesting and more than readable. 276 pages, ill; published by Rinehart & Co., New York, no price given.

CEMENT & CONCRETE

The Cement and Concrete Reference Book for 1951 has been published by the Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill. It gives a lot of interesting and useful facts about the history, manufacture and uses of Portland cement and concrete. It is an exceptionally fine job of publishing. Sent on request.

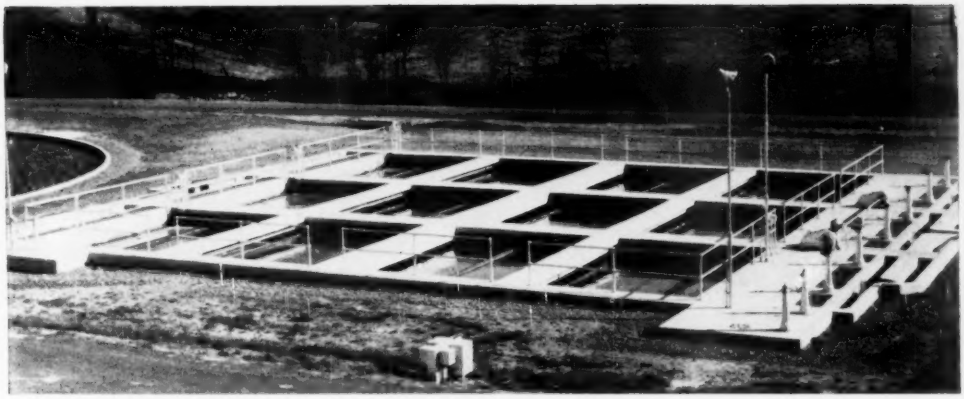
TRIAXIAL TESTING

This is a compilation of the papers on triaxial testing of soils and bituminous mixtures which were presented at the San Francisco meetings in 1949 and the Atlantic City meetings in 1950. These are published as Special Technical Publication 106 by the ASTM; 1916 Race St., Philadelphia 3, Pa. There are 13 papers; 310 pages; illustrations; and the cost is $3.50.

WATER SUPPLY

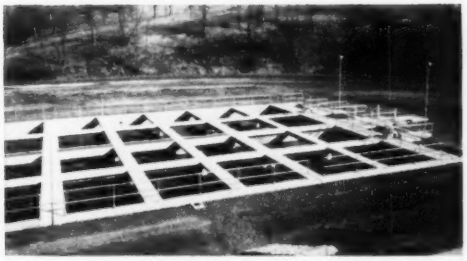
The "Manual of British Water Supply Practice" represents the work of more than a hundred experienced water works engineers

(*Continued on page 26*)

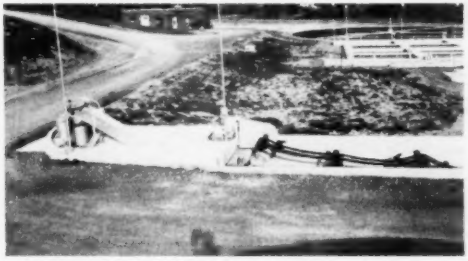


ROTOLINE SKIMMERS and Straightline Sludge Collectors in three 20 x 70 ft. primary settling tanks reduce suspended solids 59%, under actual operating conditions, in 1.76 hour detention time. Settling rate is 1220 gpd per sq. ft. tank area.

How to treat sewage for ¼¢ per day per capita



STRAIGHTLINE SLUDGE COLLECTORS — two longitudinal and one cross type — convey sludge to sumps in four 33 x 115 ft. final settling tanks. Peak-cap bearings, pivoted flights and "Straightline" action provide a positive, efficient combination.



STRAIGHTLINE GRIT COLLECTOR AND WASHER for 30 ft. grit chamber effectively collects, washes and removes settled grit — separates it from putrescible organic matter. Long-wearing Promal collector chain and rugged screw conveyor give low-cost long life.

LINK-BELT equipment plays prominent role at efficient Winchester, Va. sewage treatment plant

A PIONEER in Virginia's intensified pollution-abatement campaign, the city of Winchester recently placed in operation a 2.4 mgd Bio-filtration Plant. Designed by Alexander Potter Associates, consulting engineers, the plant is giving excellent sewage treatment at an operating cost of only ¼ cent per day per capita.

Major equipment used in this installation includes Link-Belt Straightline Sludge Collectors for all primary and final settling tanks, Rotoline Grease Skimmers and Straightline Grit Collector and Screw Conveyor-Washer.

The complete L-B line is designed and built to highest standards and backed by more than 30 years' experience in this field. Link-Belt sanitary engineers will work with your engineers, chemists and consultants — help you get the best in modern liquid treatment.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,538

Now's the time to mail this month's Readers' Service card.

Preferred power for self-contained refrigerating units on motor-cargo trailers — the world's most widely used single-cylinder gasoline engines.

BRIGGS & STRATTON single-cylinder, 4-cycle, air-cooled gasoline engines are the "Preferred Power" leader — on equipment, machines, tools, appliances used by the transportation, construction, oil-fields and other industries — and on farms. Briggs & Stratton Corporation, Milwaukee 1, Wisconsin, U. S. A.

In the automotive field Briggs & Stratton is the recognized leader and world's largest producer of locks, keys and related equipment.

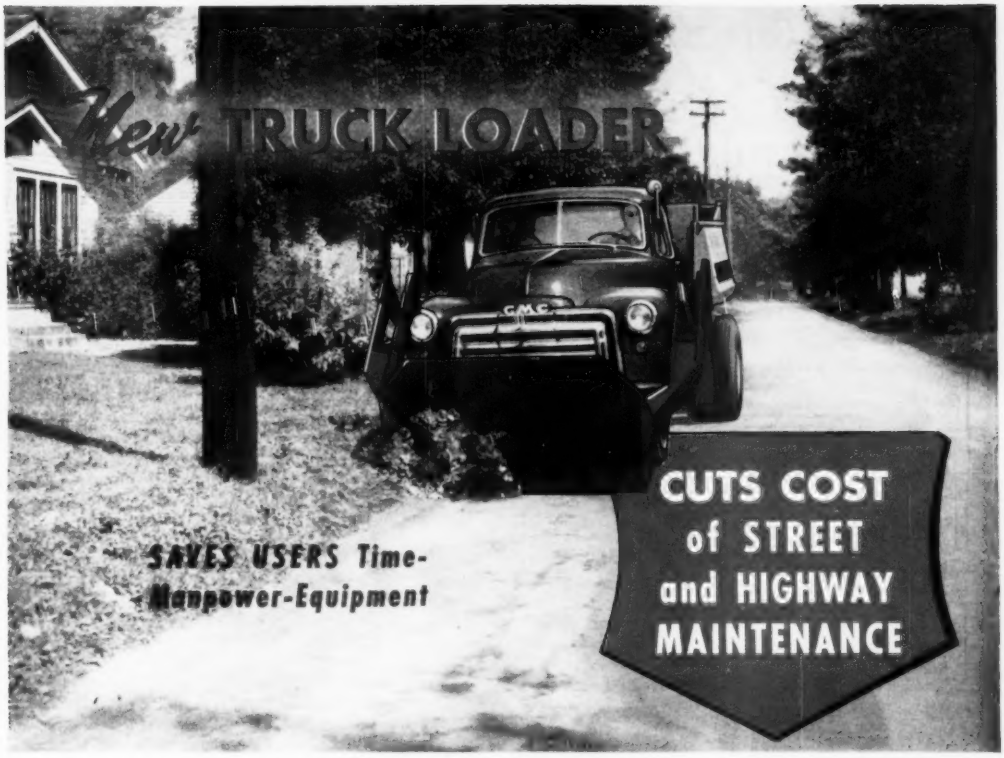
Thousands use our Readers' Service card to keep up to date . . . do you?

LEADERS IN THE PUBLIC WORKS FIELD

George J. Van Dorp, who has been Commissioner of Water for the city of Toledo, Ohio, since 1944, has had a career that may read like a fairy story to some. Born in Belgium, he entered training as an apprentice at the age of 11 and became a journeyman weaver in the textile industry at the age of 13. His family brought him to the United States in 1910, and he was engaged in farming until his entry into military service in World War I.

Then he started his engineering the hard way. By extension and correspondence courses and by night school attendance, he was graduated in mechanical, electrical and combustion engineering; he did four years of post graduate work in sanitary engineering. He is a registered professional engineer, a member of the AWWA, an officer in the Ohio Section, AWWA, and past president of Ohio Chapter of NAPE.

Last October the people of Toledo demonstrated their faith in his good judgment by voting approval of a revenue bond issue of $7,500,000 to improve the water distribution system and install softening. So he has an active and interesting job to do. In the meantime, his hobbies are work in fraternal organizations and fishing. He is married to a charming lady, Mrs. Gertrude Van Dorp. His daughter, recently married, completes the family.



THE NEW Holmes-Owen Loader offers a very practical solution to the problem of today's increasing cost, on street and highway maintenance jobs. The installation of a self-loader reduces the cost of such operations for with this driver-operated unit, one man now does the work of several. The versatile one-man operation of a loader-equipped truck, not only speeds up material handling but substantially reduces the cost per ton handled. It saves time, labor and equipment by permitting the truck driver to do his own loading, hauling, and unloading without extra help or the use of more costly equipment. The new truck loader is today being profitably used by states, municipalities, contractors and numerous commercial and industrial firms. Write factory today for details on this unit which is unsurpassed for handling stock pile materials, snow removal, cleaning-up and dozens of other practical uses.

Manufactured by
Makers of HOLMES WRECKER Equipment

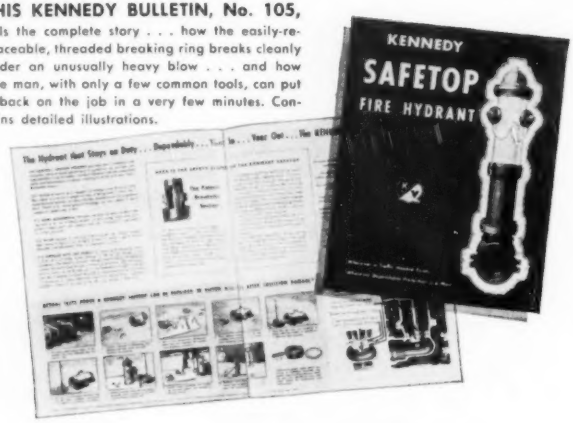
Permits DRIVER to LOAD, HAUL, DUMP, Do Light DIGGING, Grading, Cleaning-up

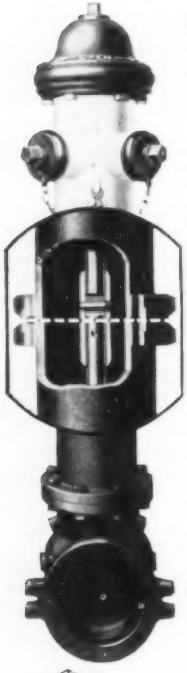
ERNEST HOLMES COMPANY
Chattanooga, Tennessee

Need more facts about advertised products? Mail your Readers' Service card now.

See how one man can repair a KENNEDY SAFETOP hydrant in only 11 minutes . . .

THIS KENNEDY BULLETIN, No. 105, tells the complete story . . . how the easily-replaceable, threaded breaking ring breaks cleanly under an unusually heavy blow . . . and how one man, with only a few common tools, can put it back on the job in a very few minutes. Contains detailed illustrations.





KENNEDY SAFETOP FIRE HYDRANTS are the toughest to knock out . . . yet, the easiest, the quickest, and the most economical to repair, even after being smashed or broken by a car or truck. This means a substantial saving for your community . . . in labor and maintenance costs. It also means better, safer fire protection. And it can make *your* job easier, too!

GET ALL THE FACTS! You'll want this informative KENNEDY hydrant booklet in your files. It gives valuable information on the design and maintenance of *modern* KENNEDY Fire Hydrants.

WRITE TODAY FOR KENNEDY SAFETOP BULLETIN 105

THE COMPLETE KENNEDY LINE includes a wide range of A.W.W.A. valves, as well as fire hydrants. Valves are made with iron 50% stronger than ordinary cast-iron . . . in a wide variety of types. Sizes from 2" to 60". For extra quality and dependability, standardize on KENNEDY.

WRITE FOR BULLETIN 106

Est. 1877

THE **KENNEDY**
VALVE MFG. CO. • ELMIRA, N.Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

BOOKS IN BRIEF (Cont.)

(*Continued from page 22*)

and other specialists. It contains 25 chapters, covering the entire field of water procurement, treatment and distribution. There are 928 pages, with many charts and illustrations. $7.50. Order from AWWA, 521 Fifth Ave., New York 17, N. Y.

ENGINEERING DESIGN

This is Vol. 1, revised, of the Data Book for Engineers. The exhaustive collection of drawings and tables covers structures, roads, bridges, dams, sewerage and water supply systems, and other classifications. There are data on soil behavior and the application of mechanics to soils, as well as the latest airport layouts. Swimming pools and rigid frame structures are also covered. The first volume of a 3-volume series of the data necessary to design and construct civil engineering structures. This second edition of Vol. 1 contains 528 pages. By Elwyn E. Seelye. John Wiley & Sons, Inc., 440 Fourth Ave., New York, $10.

SPECIFICATIONS & COSTS

This is Vol. 2, revised, of the Data Book for Engineers. It provides engineers and architects with specifications and costs for site investigations, industrial buildings, airports, bridges, docks, roads, drainage, etc. Also included are costs for such items as seeding and sodding, industrial buildings per square foot, and many other items. Vol. 2 contains 506 pages. By Elwyn E. Seelye, John Wiley & Sons, Inc., 440 Fourth Ave., New York. $13.

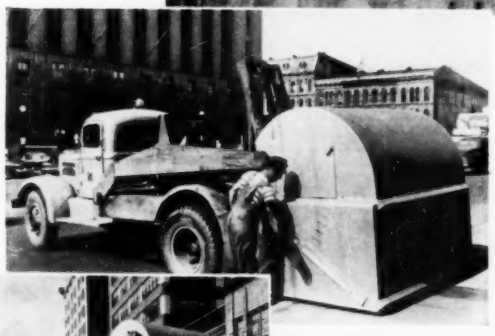
SOIL MECHANICS

Introductory Soil Mechanics and Foundations is the title of this father and son book (at least we think it is) by George B. Sowers, long and favorably known consulting engineer and World War II Army officer, and George F. Sowers, Associate Professor at Georgia Tech. The foreword says, in part: "This book is written for undergraduate civil and architectural engineering students and for practicing engineers who encounter soil problems in the everyday work." Our congratulations to the Sowers' for a fine job, which ought to be in the library of every practicing engineer. 275 pp., $4.75. Macmillan Co., New York.

The DEMPSTER DUMPSTER® Rubbish Collection System

Eliminates DISEASE Carriers

In a single year rats cost an estimated $2 billion in damage to food, property and human life in the U. S. These disease carriers settle most commonly within a few feet of conventional garbage cans behind your business establishments, schools, grocery stores, etc. With rat-proof, scavenger-proof Dempster-Dumpster Containers, you can eliminate rats at rubbish accumulation points . . . keep rubbish completely out of sight at all times . . . and cut your collection costs in half at the same time! One truck-mounted Dempster-Dumpster, with only one man, the driver, picks up, hauls and empties a multiple number of these big containers, one after another. Without question, the Dempster-Dumpster System is the most sanitary method of bulk rubbish collection ever devised. Manufactured exclusively by Dempster Brothers, Inc.



THREE STAGES of quick pick-up, hauling and dumping are shown while Dempster-Dumpster is at work in Nashville, Tennessee.

One Dempster-Dumpster Services All Containers . . . All Designs. . . All Sizes

DEMPSTER BROTHERS, 922 Dempster Building, Knoxville 17, Tennessee

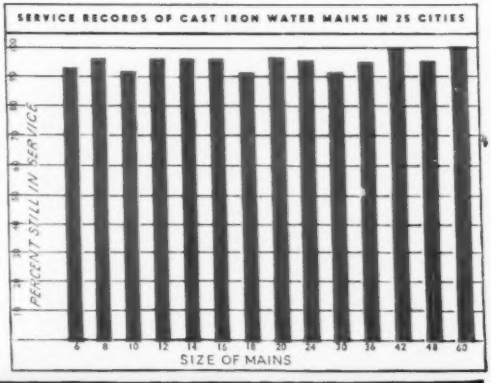
Get full details of this month's new products . . . mail your Readers' Service card today.

No doubt about the stamina

Service Records of Cast Iron Water and Gas Mains
• Black dots represent original cast iron mains in service
★ Red stars represent cast iron mains in service 100 years or more
Pacific Ocean
Atlantic Ocean
Gulf of Mexico

AMERICA PROVES IT! The above map shows cities having some or all of their *original* cast iron water or gas mains still in service. The red stars indicate 34 cities having cast iron water or gas mains in service that were laid a century or more ago.

SURVEYS PROVE IT! A recent study directed by 3[illegible] Water Works Associations shows that 96% of all cast iron water mains, 6-inch and over, *ever laid* in 25 representative cities, are still in service.


SERVICE RECORDS OF CAST IRON WATER MAINS IN 25 CITIES
PERCENT STILL IN SERVICE
SIZE OF MAINS
6 8 10 12 14 16 18 20 24 30 36 42 48 60

CAST IRON PIPE

Now's the time to mail this month's Readers' Service card.

# of CAST IRON PIPE...

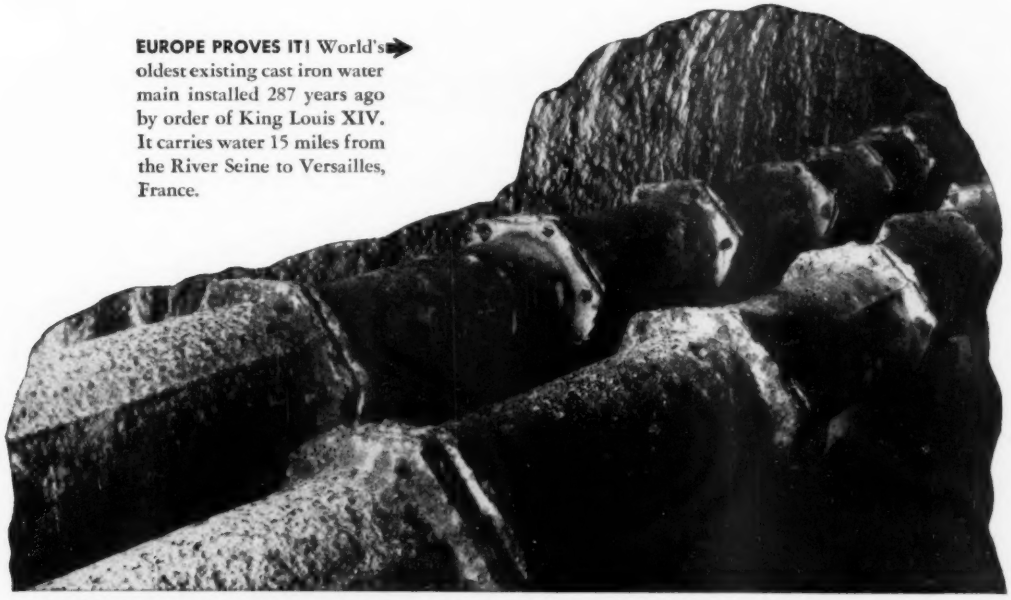
Europe proves it! The oldest cast iron water mains in the world, by authenticated records, supply the town and parks of Versailles, France. They were installed in 1664 and are still functioning after 287 years of service. Other cities in France, Germany and the British Isles have cast iron mains in service that are over 100 years old.

America proves it! Original cast iron mains are still serving 57 of America's largest cities. And 34 cities have either cast iron water or gas mains in service that were laid over 100 years ago (see map).

Surveys prove it! An exhaustive study, directed by a Joint Committee representing 3 Water Works Associations, shows that 96% of all cast iron water mains, 6-inch and over, *ever laid* in 25 representative cities, are still in service (see chart).

Yes, history proves beyond doubt that cast iron pipe has the stamina and the strength-factors that pipe must have to serve dependably under the paved streets of cities, towns and villages.

EUROPE PROVES IT! World's oldest existing cast iron water main installed 287 years ago by order of King Louis XIV. It carries water 15 miles from the River Seine to Versailles, France.



CAST IRON PIPE RESEARCH ASSOCIATION; THOS. F. WOLFE, MANAGING DIRECTOR, 122 SO. MICHIGAN AVE., CHICAGO 3.

SERVES FOR CENTURIES

Thousands use our Readers' Service card to keep up to date . . . do you?

Transite Pipe is a product of modern engineering and research. Shown above is one of the buildings at the Johns-Manville Research Center at Manville, New Jersey.

*Transite is a registered Johns-Manville trade mark

Johns-Manville TRANSITE

Need more facts about advertised products? Mail your Readers' Service card now.

TRANSITE PIPE last longer California city streets? ➧

Transite Pipe was first installed by this California city nearly 20 years ago. Its lasting strength and high corrosion resistance have enabled it to outlast pipe previously used several times over.

Research designed it for lasting strength

TODAY, ACROSS THE COUNTRY—under countless city streets like the one shown above—Transite® Pressure Pipe is doing a highly efficient job of transporting water . . . often under conditions so adverse to ordinary pipe that engineers marvel at Transite's ability to stand up through the years!

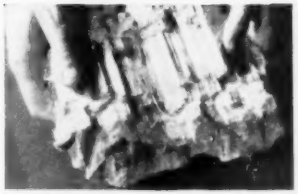
The reason? *Lasting strength!*

Not only does Transite Pipe have the *initial* strength that's needed in a pipe intended for use under busy city streets. Equally important, it has the *lasting* strength that enables it to survive continued corrosive attack, year after year . . . to keep on giving the same dependable, economical service to the community as the day it was installed.

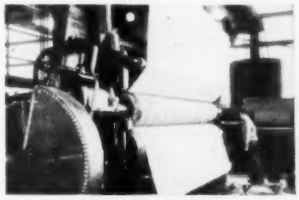
This highly important quality of lasting strength is one of many notable inherent advantages of a pipe engineered with modern water transportation requirements in mind. Transite's Simplex Couplings reduce leakage losses to a minimum, provide flexibility to help relieve the line of soil stresses and traffic loads. Its light weight makes for easier handling and effects substantial savings during installation. Its smooth interior assures a high coefficient of flow (C=140) and, because Transite can never tuberculate, helps keep pumping costs low through the years.

Why not get all the details . . . find out how this modern-engineered-for-the-job asbestos-cement pipe can help solve your water-line problems and *save you money?* For full information, write Johns-Manville, Box 290, New York 16, N. Y.

JOHNS MANVILLE JM PRODUCTS



Tough, strong asbestos fibers reinforce Transite Pipe—contribute to its high corrosion resistance and lasting strength.



On machines like this, the asbestos-cement-silica mixture is "built up" under heavy pressure into a dense, homogeneous pipe structure.

Transite's flexible Simplex Couplings help relieve the line of excessive flexural stresses—an added safeguard against pipe failures.

asbestos-cement PRESSURE PIPE

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

Free TO HELP YOUR PUBLIC WORKS PROGRAM

The engineering information in these helpful catalogs will aid you in Engineering and Public Works programs. Just circle numbers you want on the coupon or write the manufacturer direct and mention PUBLIC WORKS.

NEW LISTINGS

Valuable Booklet on Porous Diffuser Plates and Tubes

21. A helpful 20-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in activated sludge plants. Full data for the designing engineer is provided by careful detailing of physical characteristics of plates and tubes. Maintenance of porous media also is discussed at some length. For your copy of Form 1246, write to the Norton Co., Dept. PW, Worcester 6, Mass., or use the coupon.

Vacuum Filters Feature Easy, Non-Clog Operation

241. Get full data on vacuum filters using double layers of continuous coil springs that insure continuous, non-clog operation. Coils are automatically cleaned at each revolution. Komline-Sanderson Engineering Corp., Peapack, N. J.

Parabolic Deck Screen Steps Up Efficiency

22. A vibrating screen which may be attached to any conveyor or bucket loader to discharge directly into a truck is available from Kolman Mfg. Co., West 12th St., Sioux Falls, S. D. This screen features a parabolic deck which spreads the material to utilize full screen area. Complete details in bulletin available by checking the coupon.

Helpful Data on Swimming Pools

26. Data on injector nozzles for complete recirculation, fittings for correct drainage and other useful information for pool design are covered in Manual SP issued by Josam Mfg. Co., Michigan City, Ind. Check coupon for your copy.

Compact "Auto-Air" Compressor Eliminates Second Engine

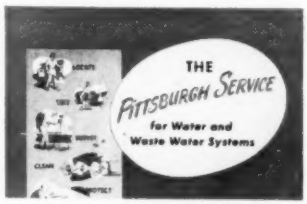
40. A second engine is eliminated by the Davey "Auto-Air" compressor, which is powered by a power takeoff on the truck drive shaft. Compact design permits utilization of remainder of truck body space for transportation of men, tools and materials. Be sure to investigate this efficient compressor that lets one truck do the work of two. Davey Compressor Co., Kent, Ohio.

Reference Catalog for Valves, Fittings and Hydrants

72. A complete line of gate valves for all services, standard flanged and screwed fittings, and the Kennedy "Safetop" fire hydrants are fully described in Catalog 63 of The Kennedy Valve Mfg. Co., Elmira, N. Y. All engineers who specify valves, fittings and hydrants should have this valuable catalog for ready reference. Check the coupon.

Construction and Engineering Service For Water and Waste Systems

97. In addition to their nationally-known water and sewer system rehabilitation services, the Pittsburgh Pipe Cleaner Co., 133 Dahlem



St., Pittsburgh 6, Pa., is now prepared to furnish complete engineering and construction service, including surveys, tests, design and construction. A full and concise description of these services will be found in an attractive new folder. Get your copy by checking coupon.

Complete Bulletin of Sewage and Water Treating Equipment

98. In a new bulletin, No. 100-A, the complete line of Hardinge equipment for treatment of water and sewage is described and illustrated. Get your copy of this useful reference bulletin from Hardinge Co., Inc., 240 Arch St., York, Pa. Use the coupon today.

Efficient Heating for Temporary Buildings and Garages

105. Portable Fageol Heat Machines are designed to spray heated air at floor level where it will most effectively heat workmen and equipment in garages, temporary buildings or canvas shelters on the job. Warmth and comfort will speed up your work, so get Bulletin L-4782 from Fageol Heat Machine Co., 5725 Mt. Elliott Ave., Detroit 11, Mich.

End Root Problems With Root-Proof Sewers

107. Troubles caused by roots and corrosions in house connections can be eliminated by the use of root-proof Bermico sewer pipe. Full details on this smooth, waterproof, tight-sealing pipe available by checking the coupon, or write to the Brown Co. Dept. PW, 150 Causeway St., Boston 14, Mass.

Seven Advantages of Prestressed Concrete Steel-Cylinder Pipe

43. All the things you want in water supply lines: permanency, structural strength, high carrying capacity, easy tapping, design flexibility, easy installation and economy are claimed for Prestressed Concrete Steel-Cylinder Pipe made by Price Brothers Co., 1932 East Monument Ave., Dayton 1, Ohio. Get full details by checking the coupon.

Inexpensive Ditcher Handles Heavy Digging

45. The Shawnee Scout Ditcher, a new, heavier model for extensive digging has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kans. Just check the coupon.

Efficient Underdrains for Rapid Sand Filters

59. Be sure you have engineering data on glazed fire clay tile filter bottoms, designed for efficient filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carson St., Pittsburgh 4, Pa.

How to Dig Low Cost Trench Under All Conditions

61. The Barber-Greene Runabout ditcher features hydraulic control of crowding speed, independent of bucket line speed, to provide maximum digging efficiency under all soil conditions. One-man operation and mobility from job to job result in trenching at the lowest cost. Get Bulletin 705-A now for full details on this money-saving machine. Barber-Greene, Aurora, Ill.

MORE LISTINGS ON PAGES 32 TO 42

Clip AND MAIL TODAY

READERS' SERVICE DEPT. PUBLIC WORKS MAGAZINE 310 East 45th Street, New York 17, N. Y.

Please send me the following literature listed in the Readers' Service Dept. of your February issue.

Booklets from pages 32 to 42:

20	21	22	23	24	25	26	27	28	29	31	33	34	36	39	40	41	43	45
46	49	55	59	60	61	62	63	65	70	72	74	80	82	83	86	89	96	97
98	99	101	105	107	108	110	112	116	117	122	125	126	128	129	130	131	137	138
145	147	149	150	154	155	159	164	166	168	169	183	194	195	199	202	210	215	216
224	226	227	229	239	241	249	253	256	264	277	278	279	280	281				

New Products, pages 113 to 116:

2-1	2-2	2-3	2-4	2-5
2-6	2-7	2-8	2-9	2-10
2-11	2-12	2-13	2-14	2-15
2-16	2-17	2-18		

Name .....

Occupation .....

Street .....

City ..... State .....

THIS COUPON NOT GOOD AFTER MARCH 31st, 1952

MOBIL-SWEEPER AND ITS DEALERS

THANK THE PUBLIC OFFICIALS
148 MOBIL-SWEEPERS ORDERED & DELIVERED IN 1951

Mobil-Sweeper's Family of Dealers Extend Greetings For 1952

and advises early purchases of your anticipated requirements for street sweeping equipment because materials control can quickly alter production and delivery schedules.

Your sweeping budget will go farther when your city is equipped with Mobil-Sweepers. Operating under all conditions, Mobil-Sweeper is *unexcelled* in sweeping ability. Add to this the extra advantages of lower maintenance plus greater safety to drivers and you know why there's an ever-increasing demand for this sweeper.

CONSIDER ALL THE SAVINGS—Whether you use the central dumping system or haul refuse directly to the dump, Mobil-Sweeper's extra speed (travels at top legal speeds when not sweeping) reduces "dead-heading" time between sweeping area and dump. Less time is spent traveling from service yard to sweeping area.

LOWER MAINTENANCE COSTS—Because Mobil-Sweeper is built on a modified International Harvester Truck chassis, your regular maintenance methods and equipment for trucks is applicable to this sweeper. Here is a major saving in upkeep and your costs are materially reduced on specially designed parts and tools.

WHY A SAFER SWEEPER PAYS OFF—Even a slight injury is costly. That's why Mobil-Sweeper provides a heavy steel cab on every sweeper. The driver is protected from low hanging branches...he's protected by shatterproof windshields in accordance with safe driving methods. Visibility is better—no blind spots out front. Four-wheel hydraulic brakes assure safe stops even when sweeper is fully loaded. And all-weather comfort is afforded by the cab.

MOBIL-SWEEPER IS EASY TO MANEUVER—For effective sweeping, no full-size sweeper will out-maneuver a Mobil-Sweeper. It gets in and around parked cars with complete ease and clean sweeping... sweeps clean on sharp curb returns, up and down hills.

Your Community Will Find Mobil-Sweeper Best All Ways!

MOBIL-SWEEPER
DIVISION OF
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LOS ANGELES 58, CALIF.

CONVEYCO

THE CONVEYOR COMPANY
3260 East Slauson Avenue, Los Angeles 58, Calif. J W-13

Gentlemen:
Please send catalog with complete details and specifications for the Mobil-Sweeper.

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Now's the time to mail this month's Readers' Service card.

FREE

to WATER WORKS and SEWAGE MEN

HOW TO CONTROL ALGAE

"The Use of Copper Sulphate in Control of Microscopic Organisms" by Dr. Frank E. Hale (former Director of Laboratories, Dept. of Water Supply, City of New York) is an authoritative work concerning the control of micro-organisms and elimination of tastes and odors. Describes in detail methods of controlling various forms of microscopic life commonly encountered in water supply systems. Contains descriptive material, plus 48 photo-micrograph studies of organisms discussed.

ROOT AND FUNGUS CONTROL

"Copper Sulphate for Root and Fungus Control in Sanitary Sewers and Storm Drains," by John W. Hood, contains information published for the first time. This material includes actual methods for control and operating procedure. Here's the book that is a "must" for all sewage men.

GET EITHER OR BOTH OF THESE BOOKLETS ABSOLUTELY FREE— These two valuable booklets, so important to all water works and sewage men, are yours *without obligation.* Mail coupon below!

Write Today, Supply Limited!

PHELPS DODGE REFINING CORPORATION
40 Wall Street, New York 5, N. Y.

Please send my free copy of (check one or both):

☐ "Control of Microscopic Organisms"

☐ "Copper Sulphate for Root and Fungus Control in Sanitary Sewers and Storm Drains"

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PW-2

Versatile Road Wideners Improve Highways at Low Cost

116. In a new bulletin the full line of Apsco wideners, base pavers, bituminous pavet finishers, widening chippers and tandem rollers is described and profusely illustrated. Versatile wideners can handle stone, concrete or bituminous mix, all without forms. Be sure to investigate this easy way to modernize your highways. Get full data from All Purpose Spreader Co., Elyria, Ohio, by checking the coupon.

Pneumatic Ejectors Solve Pumping and Drainage Problems

110. A new 12-page catalog describing all types of Shone Pneumatic ejectors is available from Yeomans Brothers Co., 1433 N. Dayton St., Chicago 22, Ill. Complete information on both mechanically and electrically controlled ejectors is presented. Get Bulletin 4000-C by checking the handy coupon.

Be Sure to Investigate The Gledhill Grader

117. For economical maintenance of streets and highways, be sure to check the advantages offered by use of the Gledhill grader, product of the Gledhill Road Machinery Co., Galion, Ohio. For complete specifications on several models, just check the coupon.

Corrosion Protection For Water Works

280. Steel pipe lines, elevated tanks, treatment plant equipment and all other steel structures subject to rust, tuberculation and attack by aggressive soils can be protected by long-lasting Bitumastic enamels. Send for bulletins today so that you can specify the right coating for your job. Use coupon or write Koppers Co., Tar Products Div., Dept. 255T, Pittsburgh 19, Pa.

Book Tells How to Control Root Stoppages

299. Details on the proven use of copper sulfate to control root and fungous growths in sewers are contained in a brand-new book published by Phelps Dodge Refining Co., 40 Wall St., New York 5, N. Y.

●

PEST CONTROL

Chemicals for All Pest Control Work

199. Full data on dosages and methods of application of DDT, Chem-Lary, Lindane and other chemicals for insect control, plus weed control with Chem-Weed, 2,4-D, 2,4,5-T and TCA, are available from Chemical Insecticide Corp., 57—13th St., Brooklyn 15, N. Y.

●

STREETS AND HIGHWAYS

How the Mobil-Sweeper Can Improve Street Sweeping

23. Sweeping costs can be cut with the new Mobil-Sweeper which features safe highway speeds up to 55 mph, carries 2 2/3 cu. yd. dirt hopper, sweeps swath up to 10' wide with full floating brooms. Hills and deep gutters are no obstacle. Write to The Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif. or use coupon for complete details on this machine.

Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of equipment for black top road construction and maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use coupon for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

Specifications for Jointing Reinforced Concrete Pipe

63. Engineering specifications for use of Hesseal rubber gaskets with reinforced concrete sewer pipe are contained in a new brochure published by Universal Concrete Pipe Co., Dept. PW, 297 S. High St., Columbus, Ohio. Subjects include dimensions, pipe design reinforcement, curing and jointing instructions. Get your copy by checking the coupon.

THE LEOPOLD GLAZED FIRE CLAY TILE FILTER BOTTOM

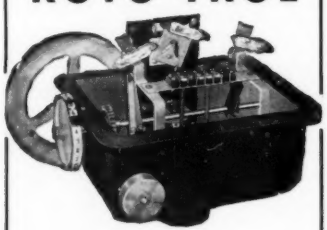
Check These Features!

● Low loss of head ● Adaptable to any rectangular unit ● Practically non-absorbent ● Resists acid, alkali solutions ● Long life ● Equal filtration, distribution ● Proved superiority.

Write for details!

F. B. LEOPOLD CO. INC.
2413 W. Carson St., Pittsburgh 4, Pa.

ROTO-TROL



RF-2 with ALTO-TROL

Puts that second pump to work.

A 2-pump RF-2 ROTO-TROL with a built-in ALTO-TROL will operate each pump on alternate starting cycles, assuring equal use and wear of both pumps. Operates both pumps when required.

Depth Indicator optional—extra.

Write for full data.

Water Level Controls Division

HEALY-RUFF Company
791 Hampden Ave., St. Paul 4, Minn.

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 10, Wis.

Get Data Now On This Catch Basin Cleaner

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

Uniform Salt Spreading Saves Material

145. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on this spreader and table of material application rates. Use coupon or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Black-Top Paver Offers Many Advantages

150. The flexible Adnun Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Combination Overhead And Front-End Shovel

194. The "Lodover", described in Bulletin LO 200, is a combination overhead and front-end shovel for International T-9 and TD-9 tractors. By digging in front, swinging load overhead and dumping to the rear, extra yards are handled every hour. Regular front-end loading is not impeded in any way. Service Supply Corporation, 2004 Erie Ave., Philadelphia 32, Pa. Check handy coupon.

Check Coupon on page 32 to order this FREE EQUIPMENT DATA

New Portable Roller Performs Many Jobs

60. An attractive four-color catalog No. 350 presenting their new portable roller is available from The Galion Iron Works and Mfg. Co., Galion, Ohio. Construction and operation features include: hydraulic steering, constant mesh transmission, spur gear final drive, variable weight compression roll and towing hitch with built-in hydraulic jack. Use the handy coupon for your copy.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Eliminate Hazard of Loose Gravel on Roads

125. Accidents caused by loose gravel can be checked and costly gravel loss reduced by proper stabilization of your gravel roads. Investigate the low-cost stabilization and gravel salvage methods offered by the Seaman Pulvi-Mixer. Bulletin "Stabilize Gravel Roads" is well worth studying. Check the coupon today. Seaman Motors, Inc., 305 N. 25th St., Milwaukee 3, Wis.

Sweepings Rehandling Eliminated By Detachable Hopper

108. Be sure to investigate this new method for cutting street sweeping costs by use of Dempster-Dumpster detachable hopper in combination with Elgin sweeper. Hand loading of sweepings eliminated since hydraulic controls lift hopper in place on sweeper; quickly replace full hopper with empty one to save sweeper travel time. No unsightly piles of dumped sweepings. Full details in Folder 1104, available by checking coupon. Dempster Bros., Inc., Knoxville, Tenn.

Helpful Installation Manual For Drainage Structures

62. A 46-page manual, well worth careful study by designers and field engineers dealing with drainage structures, culverts, sewers or conduits, is offered by Armco Drainage & Metal Products, Inc., Middletown, Ohio. Proper location of the structures, base preparation, assembly and backfill are some of the many items covered in detail. Use the handy coupon for free copy.

Snow Plows for Every Street and Highway Need

227. In a new bulletin, No. 51-F, full details are given on the Frink reversible trip-blade "Sno-Plow", which has special design features to eliminate chatter and to permit quick adjustment to nine plowing positions or scraping position for ice removal. Check the coupon for your copy. Frink Sno-Plows, Inc., Clayton, N. Y.

Heating, Thawing and Melting With Hauck Burner Equipment

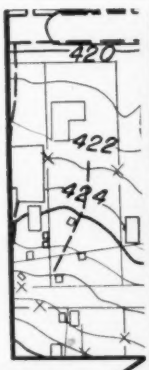
277. A helpful 16-page bulletin covers the complete line of Hauck heating and melting equipment. Data covers units for every water, sewer and street department purpose, from "one-man" burners to large size portable kettles. For a useful addition to your reference file, get Bulletin 1068 from Hauck Mfg. Co., 117-127 Tenth St., Brooklyn 15, N. Y.

Fast Mowing in Hard-to-Reach Places

279. The lightweight, power driven Sythette cuts smoothly in rocky, hard-to-reach places; does the job 4 times faster than ordinary methods. Illustrated folder offered by Hoffco, Inc., Richmond, Ind. Get your copy by using coupon.

GOOD MAPS PAY DIVIDENDS

Helping states, cities, counties, consulting engineers and others having a mapping problem is our business.



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FASTER AND AT LESS COST

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How MUD-JACK STABILIZES SUB-GRADES

Send for 20-page engineering handbook on Koehring Mud-Jack method

Koehring Mud-Jack® pumps inexpensive soil-cement slurry into small holes drilled thru pavement . . . raises the concrete slab, leaves firm, lasting sub-grade. Corrects grades of curbs, gutters, sidewalks, driveways. Two sizes: compact, portable No. 10 (illustrated) for city work, and bigger No. 50 Mud-Jack for preventive maintenance and low-cost repairs on highways.

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It serves as a gentle reminder to direct you to your wholesaler not only for your supply of Wolverine top quality tubing, but also for all other plumbing needs you may want or for information and help on the use of the materials that will best extend the services your customers expect from your installations.

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Efficient Material Handling to Reduce Incineration Costs

130. Blaw-Knox Buckets specially designed for refuse and garbage handling are described in 22-page Bulletin 2350. Illustrations show progress of material through a modern municipal incinerator plant. Dimensions and incinerator bucket specifications are included. Blaw-Knox Div., 2124 Farmers Bank Bldg., Pittsburgh 22, Pa.

Investigate This Plan For Garbage Elimination

164. A new presentation, written especially for municipal officials, offers a modern solution for the garbage disposal problem. Be sure you have this up-to-date information on the elimination of city garbage collection by the use of Hotpoint Disposall units. Check the coupon now. Hotpoint Disposall Department, 5600 West Taylor St., Chicago 44, Ill.

An Incinerator Necessity

215. Recuperators featuring individual replacement of the heat transfer elements (silicon carbide tubes) for maximum accessibility and efficiency are described and illustrated in Bulletin 14 issued by Fitch Recuperator Co., Dept. PW, Plainfield Nat'l Bank Bldg., Plainfield, N. J.

Thinking of Sanitary Landfills? Get This Booklet Now

131. One of the most informative descriptions of the sanitary landfill method of garbage and refuse disposal is presented in Caterpillar's 16-page booklet "A Look to the Future with Sanitary Landfill." The booklet is designed to serve as a guide to proper site selections, the choice of the right equipment to do the job, and the actual operations of sanitary fill. Pictorial treatment shows how and when to start such a program, what to look for in a site, benefits received by the community, and other important considerations. Published by the Caterpillar Tractor Co., Peoria 8, Ill. Check the coupon for your copy.

CONSTRUCTION EQUIPMENT AND MATERIALS

Excellent Booklet Shows Aerial Mapping Technique

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28. Be sure to check the Traxcavator for the digging, grading, carrying and loading jobs handled by every public works department and contractor. Rated capacities range from ½ to 4 cubic yards. Full data on the Traxcavator and other machines engineered to match Caterpillar track-type tractors in Form 1106, published by the Trackson Co., Dept. PW-91, Milwaukee 1, Wis. Use coupon to order your copy.

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Handbook of Contractors Pumps Is Easy to Use

49. Big 50-page Catalog P-10 covers dewatering pumps, pressure pumps, well point systems and electric pumps, and also features a special section of useful data which helps in the selection of the right pump for your job. Every construction engineer and contractor should have a copy of this valuable handbook. Just check the coupon. The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

Municipalities Make Equipment Dollars Go Further

55. Be sure to get your copy of "Saving Facts" a new illustrated booklet prepared by The Oliver Corp. that shows how equipment dollars can be stretched on municipal work. Text and photos describe the application of tractors and money-saving attachments in street maintenance snow removal, waste disposal, pipe laying and other projects. Write The Oliver Corp., Industrial Div., 19300 Euclid Ave., Cleveland 17, Ohio.

Examining a Tractor Piece by Piece

99. The new 32-page catalog published by International Harvester Company should be studied by every tractor owner, for in it each unit from engine to track of the TD-9 Diesel is considered separately. These piece by piece discussions are supplemented by notes on easy servicing, versatile applications and attachments for every need. Get your copy of form CR-313-A from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or check the handy coupon.

Special Pumps to Fit Any Dewatering Job

101. Centrifugal Pumps. Long lasting, self-priming, non-clogging pumps for quickly dewatering trenches and similar construction jobs. Ask for Bulletin 7-LW-13. Gorman-Rupp Co., 320 No. Bowman St., Mansfield, Ohio.

30 "FLEXIBLE" power bucket machines have been working in the Kansas City flood area since August! This is no doubt America's ***all-time-biggest*** sewer cleaning job. To aid the stricken area quickly, many cities from as far away as Ohio, Minnesota and Texas made their "FLEXIBLE" equipment available under "FLEXIBLE" supervision, in addition to those immediately supplied by the factory.

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Drill Concrete With Your Ordinary Electric Drill

82. Substantial cost-per-hole savings are claimed for Tilden Rotary Drills which penetrate concrete 2" to 4" per minute. Cutters can be resharpened. Available in sizes ¼" to 4". Get full data from Tilden Tool Mfg. Co., 209 Los Molinos, San Clemente, Calif.

Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Both gasoline and electric models are discussed, and requirements outlined for many applications. Just check the coupon for your copy. The Homelite Corp., 2112 Riverdale Ave., Port Chester, N. Y.

Helpful "How To Use" Section Aids Roller Selection

195. In addition to specifications and illustrations of roller operation, the new Buffalo-Springfield catalog features a special section to help in the selection of the right roller model for the job. Be sure you get top results from your roller selection by checking this helpful material. Use the coupon for a copy. Buffalo-Springfield Roller Co., Dept. Q-7 Springfield, Ohio.

Choosing Trucks For Municipal Service

264. For all municipal services, trucks are needed that are high in efficiency and economy. Be sure to investigate the White 3000, engineered for high performance. Full details on White Super Power trucks from the White Motor Company, Cleveland 1, Ohio.

CIVIL DEFENSE

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Enterprises, Inc., 8733 So. State St., Chicago, Ill., by using coupon.

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169. Data on stationary, portable, and standby electric plants, AC and DC, are offered by D. W. Onan & Sons, Inc., 7657 University Ave., Minneapolis 5, Minn. Several bulletins cover diesel and gasoline-driven plants for every purpose. Just check the coupon for your copies.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, % Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches.

How Cities Clean Sewer Lines From Street in One Operation

25. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of OK Champion sewer cleaners give full details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

Packaged Sewage Treatment— Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

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46. A new, fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new SewerRodeR and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

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High Rate Filters For Sewage Treatment

74. Accelerated biological oxidation in treatment of sewage and other organic wastes is a feature of Infilco's Accelo Filter system. Bulletin 6200 explains the direct recirculation principle, shows plant layouts, and gives performance data. For your copy write Infilco Inc., Box 5033, Tucson, Ariz., or check handy coupon.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment; constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Connersville Blower Corp., 510 Poplar Ave., Connersville, Ind.

Engineering Data on Digester Heating

128. An excellent 32-page bulletin covering all features of the PFT External Heater and Heat Exchanger unit discusses effective digester heating, size of heater and exchanger, space requirements, building heating, and related items. Curves and tables provide full data for the designer. Requests for this comprehensive bulletin, No. 235, must be sent on business letterhead. Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

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256. Civilian government employees are offered insurance protection at the lowest possible cost by Government Employees Insurance Companies, Gov't Employees Insurance Bldg., Washington 5, D. C. Full details available by checking the coupon.

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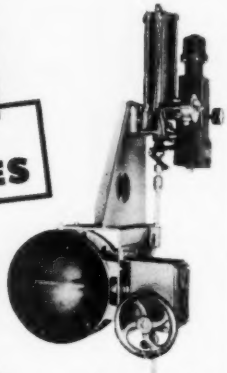

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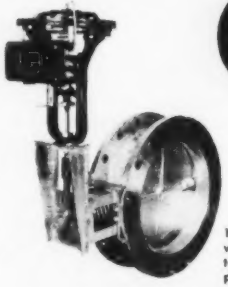

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154. Operating on the Diesel cycle, burning either oil or gas, the Worthington Supercharged Dual Fuel Diesels give high economies by running on the cheapest fuel available. Get complete data from Worthington Pump & Machinery Corp., Dept. PW, Harrison, N. J.

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WATER WORKS

How to Keep Trenching Jobs on Schedule

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CLAY PIPE—*ESSENTIAL* ★ *ECONOMICAL* ★ *EVERLASTING*

Tucson, Arizona, enlarges its municipal sewerage facilities in a $2 million program caused by defense expansion. Clay Pipe is specified not only for the sewerage project, but for the new electronics plant, the adjacent airport, the additional housing, and the Air Force base which made it necessary.

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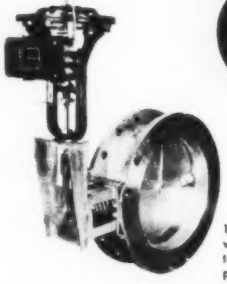

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Orlando, Fla. (Air Force Base)	74,000 ft.
Morrisville, Pa. (New Steel Defense Plant)	300,000 ft.
Rapid City, S. D. (Air Base)	54,000 ft.
Bakersfield, Calif. (Air Base)	196,000 ft.
Panama City, Fla. (Municipal Expansion)	450,000 ft.
Limestone, Me. (Air Force Base)	65,000 ft.
Tucson, Ariz. (Air Base)	440,000 ft.

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CLAY
CLAY PIPE NEVER WEARS OUT!
PIPE

C-352-1

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

How to Tap Concrete Pressure Pipe

126. The simple steps required in making a pressure tap in concrete pressure pipe are explained in a booklet issued by Lock Joint Pipe Company. Be sure you know how either large connections or small service outlets may be made economically and without sacrifice of strength. Just check the handy coupon. Lock Joint Pipe Co., Box 269, East Orange, N. J.

Helpful Data on Mechanical Joints

138. Get Circular 49 from M & H Valve & Fittings Co. for important information and installation dimensions of M & H AWWA Mechanical Joint Valves and Hydrants. Features include ease of installation, construction economy, long life. Use coupon or write M & H Valve & Fittings Co., Anniston, Ala.

What You Should Know About Fluoridation and Fluoridators

155. Two helpful publications issued by Wallace & Tiernan titled "Fluoridation" and "Fluoridators" show the development of fluoridation, list the chemicals and dosage normally used, and give full technical data on solution feed and dry feed fluoridators. Be sure to get these publications from Wallace & Tiernan by checking the coupon today.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Helpful Book Gives Pipe Flow

159. This handy 40-page pocket size book titled "Measurement of Water Flow Through Pipe Orifice with Free Discharge" explains the Layne pipe orifice meter method of computing water flow. Includes flow graphs for various size pipes. Layne & Bowler, Inc., Box 215, Hollywood Station, Memphis 8, Tenn.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking coupon.

What You Should Know About Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

Automatic Pump Control For Your Water System

239. In Bulletin 230-G4, Builders-Providence outlines the "Pressuretic Control" system which is said to save on first cost by providing ground level storage in residential areas; permit unattended operation of outlying stations; furnish instantaneous response to meet fire flow. Flow diagrams and typical applications are included. Mail coupon to check this versatile system. Builders-Providence, Inc., Providence 1, R. I.

Design Data for Hardness, Turbidity, Color or Algae Removal

253. Bulletin No. 9041 published by The Dorr Co. furnishes design data on the Hydro-Treator for high-rate, upflow type treatment of municipal and industrial water supplies. 32 pages include distinguishing features of the unit, types and sizes, capacity ratings and typical operating results. Get your copy of this helpful bulletin by using coupon today. The Dorr Co., Barry Pl., Stamford, Conn.

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Investigate This Compact Flow Meter for Water

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The "PELICAN"

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His bill holds more than his Bellycan
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Enough for a week,
I wonder just how the Hell-e-can"

A WONDERFUL PUMP IS THE PELICAN
The Lowest Priced Two-Inch Pump Of Its Capacity On The Market!

The Pelican is the Quickest Priming, Fastest Pumping, "never quit" pump available, - it challenges any pump its size and type to equal its performance.

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There are so many practical uses for Gorman-Rupp Lightweight Pumps that it is impossible to list them. They are invaluable for utility and municipal applications. Their trouble-free performance and Gorman-Rupp guarantee are your positive assurance of satisfaction.

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The Pelican 2" - wgt. 70 lbs. 7500 g.p.h. - Primes in 99 sec. at 25 ft. suct. lift.

The Midget 1½" - wgt. 62 lbs. 5500 g.p.h. - Primes in. 75 sec. at 25 ft. suct. lift.

The Hawk 2" - wgt. 110 lbs. 10,000 g.p.h. - Primes in 47 sec. at 25 ft. suct. lift.

The Eagle 3" - wgt. 117 lbs. 18,000 g.p.h. - Primes in 79 sec. at 25 ft. suct. lift.

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LIGHT!

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Bermico fiber pipe has tapered sleeve joints which are root-proof, water-tight, will not pull apart or get out of alignment. A few hammer taps seals joints permanently, and no joining compound is needed.

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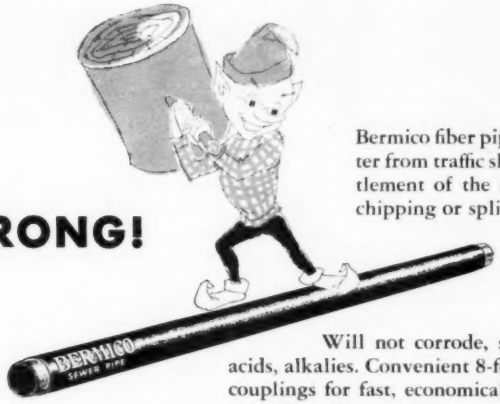

Bermico fiber pipe is sufficiently flexible so it will not shatter from traffic shock nor rupture as a result of uneven settlement of the subbase. Absorbs jars and jolts without chipping or splitting.

Will not corrode, scale or tuberculate. Unaffected by sewage, acids, alkalies. Convenient 8-foot lengths and a complete line of bends and couplings for fast, economical assembly. Write Dept. EB-2 at our Boston office for information.

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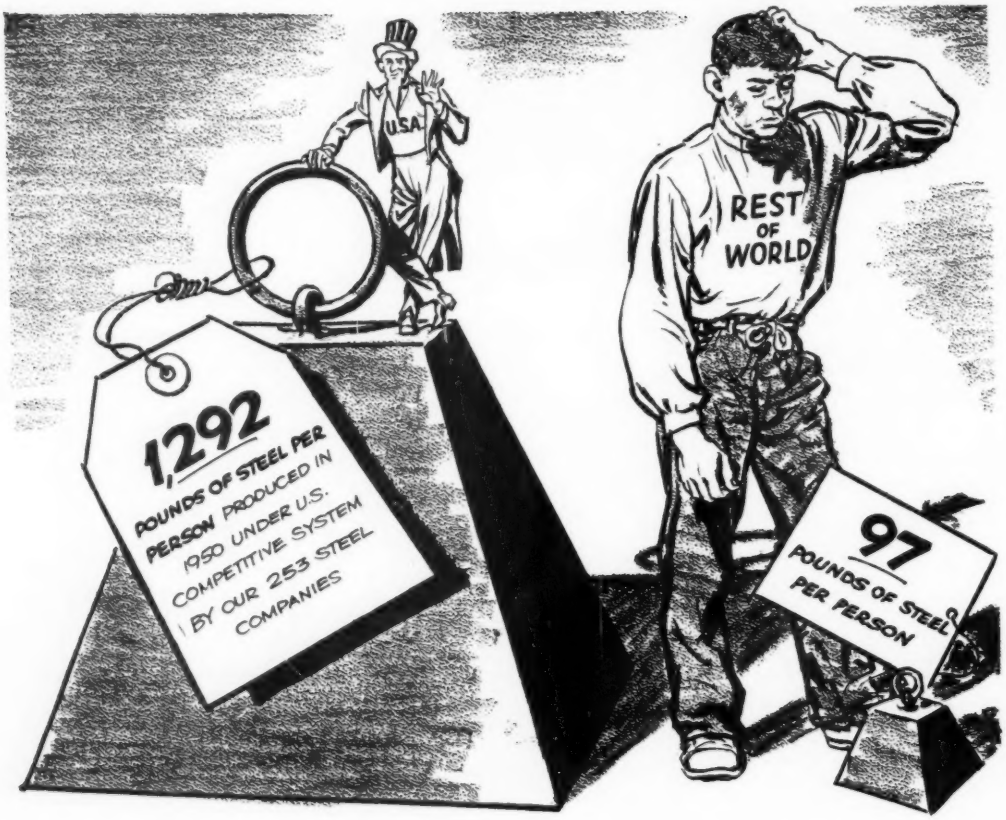
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POUNDS OF STEEL PER PERSON PRODUCED IN 1950 UNDER U.S. COMPETITIVE SYSTEM BY OUR 253 STEEL COMPANIES
REST OF WORLD
97
POUNDS OF STEEL PER PERSON

FORTY YEARS AGO the automobile was a rich man's toy. TV and radio were unheard of. Refrigeration? You hung a card in the front window to signal the ice man.

Today we drive 40 million cars, listen to 90 million radios, keep food in 33 million refrigerators.

Yet millions in the rest of the world are still groping in the primitive darkness of 40 years ago.

Why have we moved ahead? Competition is a chief reason. Only competition in business has made luxuries commonplace in your home today. Competition, for example, in the production and sale of steel and things made out of steel.

Steel makes progress possible—in war or peace . . . in the manufacture of everything from tableware to tanks, razor blades to skyscrapers, baby carriages to "Big Mo".

How well does this competition of ours work in the steel business?

. . . The U.S.A. shows an 83.4% gain in steel output between 1939 and 1950. The rest of the world shows an 0.8% loss.

. . . In 1939, the U.S.A. under "competition" made ⅓ of all the world's steel. Today we produce half—all with only 6% of the people in the world.

. . . Steel workers under "competition" gained in jobs, too. There were 449 thousand jobs in 1939. Today—637 thousand.

The steel industry is just one example of how a free competitive system works. Ours is the security millions of people in the world dream of when they embrace such dead-ends as "planned economies".

Look around and see what happens when people hand their jobs and factories over to the government. Or have them taken by law. Or by force. Name it what you will—"communism", "nationalization", "socialism","regimentation"—it is a one-way street, and no turning back. By then people no longer own government. Government owns the people.

• • •

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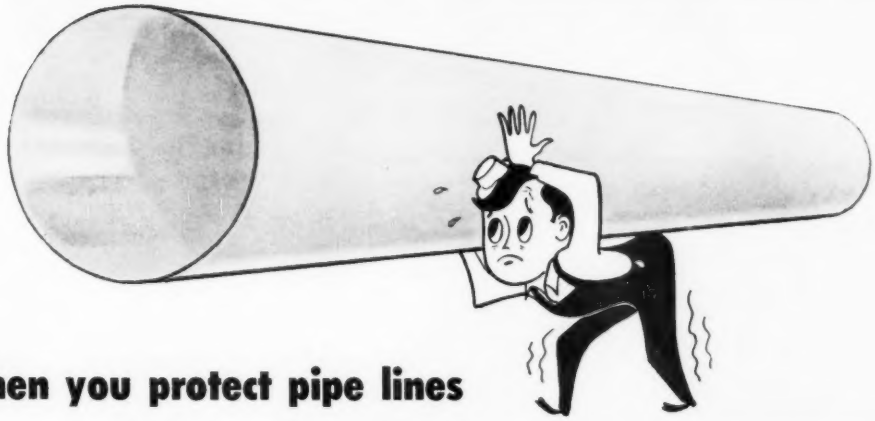

...when you protect pipe lines with BITUMASTIC® 70-B ENAMEL

PIPE LINES DON'T "SHRINK" when they're protected by Bitumastic 70-B Enamel. This durable enamel coats interior surfaces with a smooth, spun lining—a lining that prevents rust, corrosion and tuberculation.

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Bitumastic 70-B Enamel saves money on pumping costs, too. That's because it *keeps* flow capacity high. It isn't necessary, even after decades of service, to install bigger pumps that cost more to buy and operate.

Bitumastic 70-B Enamel also protects exterior surfaces of pipe lines. It prevents pitting and leakage caused by soil corrosion. Here, again, you save money on maintenance and replacement costs.

It will pay you to protect your community's steel pipe lines with Bitumastic 70-B Enamel. If you wish, our Contract Department will handle your coating jobs from start to finish, furnishing skilled men and specialized equipment. Write for full information.

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DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

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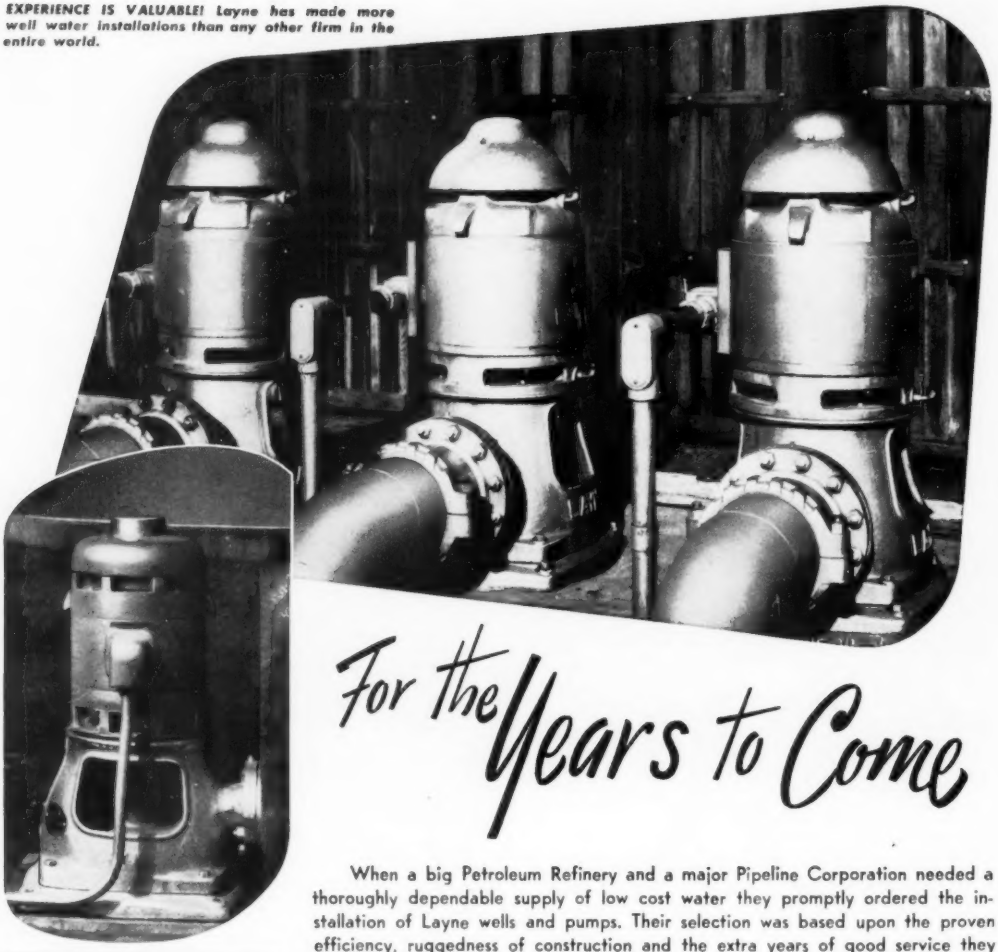
EXPERIENCE IS VALUABLE! Layne has made more well water installations than any other firm in the entire world.



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When a big Petroleum Refinery and a major Pipeline Corporation needed a thoroughly dependable supply of low cost water they promptly ordered the installation of Layne wells and pumps. Their selection was based upon the proven efficiency, ruggedness of construction and the extra years of good service they could expect from Layne well water supply units. Very wisely they invested for the future.

Thousands of Layne well and pump installations ranging from one to twenty-five or more units, are giving outstanding service for cities, factories, railroads, dairies, chemical plants, packing houses, hotels, pipelines, refineries, air fields, army camps and naval stations. All were designed, built and installed complete by Layne's own engineers and field crews.

Layne enjoys the distinction of being the world's most experienced well water developers. No other organization has so much to offer those who are in need of well water supply units. Whether the requirements are for thousands or millions of gallons of water daily, Layne is ready to serve you. For further information address

LAYNE & BOWLER, INC.
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Layne's newest water supply catalog is of utmost interest to all who are contemplating the installation of a water well and pump. It illustrates and describes the many fine features of Layne built wells and Layne Vertical Turbine Pumps. A copy will be sent on request.

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WATER SUPPLY
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In modern communities all over the nation, progressive municipal officials are finding the way to make their communities garbage-free. Planned city-wide installations of Hotpoint Disposalls® have been proved the answer. Improved sanitation through garbage elimination at reduced cost has been the result.

You can dispense with the old-fashioned, odorous, costly, and unsightly "can and wagon" garbage collection system. The Hotpoint Disposall fits under almost any sink; it shreds food waste to sewage which is then automatically washed into the sewer or septic tank. The shredded waste flows readily through sewage systems and adds negligibly to the total sewage flow.

The Hotpoint Municipal Plan of Food-Waste Disposal is based on documented experience and written especially for municipal officials. A request from you will bring the complete story on how you can provide—

- **A convenient, new and modern food-waste removal system.**
- **Health protection to the members of all families.**
- **Fly and rat pest reduction.**
- **Garbage collection cost reduction.**
- **More digester gas for use and sale.**
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- **Elimination of food waste before it becomes garbage.**
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- **Elimination of garbage collection problems.**
- **Elimination of garbage odors.**
- **True sanitation for your town.**

AND . . . IT SAVES YOU MONEY!

HOTPOINT DISPOSALL®
Eliminates "can and wagon" Garbage Collection System!

Write to Hotpoint Disposall Dept., for all the facts.

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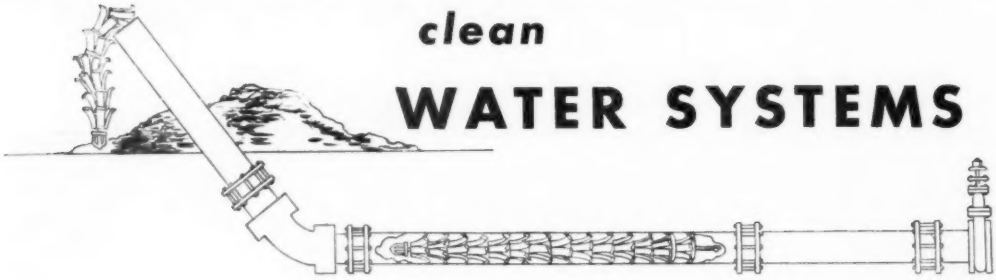
ACE Pipe Cleaning Contractors



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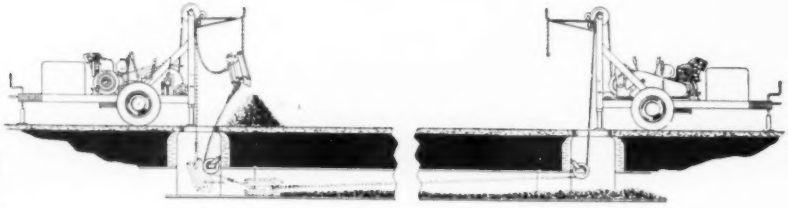

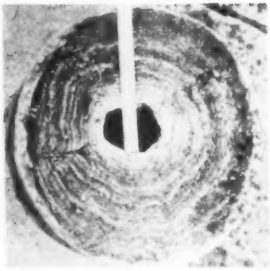

Neglected city and industrial water pipes fill with debris like this—cut down service, increase fire rates. Let ACE clean them for you!

Fast, modern water pipe and sewer cleaning service—that's what ACE Pipe Cleaning Contractors, Inc., offers your city or industry *today*, wherever you are in the United States or Canada!

Preserve your system "for the duration," while pipe and steel are in short supply, with this thorough, economical service.

ACE brings the most modern equipment known to the job, plus trained, skilled crews to get the job done right, quickly and at *lowest possible* cost. ACE has representatives in several principal cities, ready to serve you. Write for further information. Let us send a man, at no expense or obligation to you. Get in touch with us today!

Cleaning jobs done thus far in 1951: Corps of Engineers, U. S. Army; City of Kansas City, Missouri; City of Kansas City, Kansas; Swift & Company; Armour & Company; Cudahy Packing Company; General Motors Corporation; Olathe, Kansas; Belton, Missouri; Milburn Country Club; Council Grove, Kansas; Procter & Gamble Mfg. Company.

✻ Ask to see our new 21-minute newsreel movie of the great Kansas City Flood of July, 1951. No cost or obligation.

ACE Pipe Cleaning Contractors, Inc.
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Now's the time to mail this month's Readers' Service card.

HYDRAULIC CATCH BASIN CLEANER ALONE PAYS FOR VERSATILE HYDROCRANE

With big loads like this, it only takes a few passes and the Hydrocrane is off to another catch basin. And note this feature: the Hydrocrane's boom —which telescopes in and out hydraulically — is unmatched for close quarter work under low overhanging tree branches and wires.

IN considerably less than a year, actual figures* show, the Hydrocrane's hydraulic catch basin cleaner can save enough money to completely pay for the whole truck crane! For example, even in a system with as few as 2500 catch basins, the impressive savings over hand labor with this attachment alone can pay for a Hydrocrane in less than a year. And when you add the Hydrocrane's value for setting pipe, uncovering leaks or trucking, it's easy to see why this handy truck crane is tops in its field.

Operation is extremely simple. The hydraulically powered crane eases the orange-peel type bucket down into the catch basin. When it reaches bottom, the operator touches his control lever and a powerful hydraulic ram pulls the bucket lips tightly around the muck and debris. A flick of another lever and the load is hoisted out and dumped. Hand levers only — no tricky hand-foot coordination.

Users report this bucket is particularly valuable where bottles, bricks and other hard materials are dumped into the sewer, because here suction type machines simply won't work. And it's fast! Under normal working conditions the Hydrocrane has cleaned as many as 36 catch basins per day.

Get full details on this new, cost-cutting way to clean catch basins. Two Hydrocrane sizes, ¼-yd., 2-ton, ⅜-yd., 3-ton. Send coupon for details.

*we'll be happy to explain them in detail

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Gentlemen: ☐ Please send Hydrocrane literature.
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MODERNIZE with the WHITE 3000

Entirely New Kind of Truck saves time . . . reduces cost . . . does more work in public service

Typical reports from garbage and refuse collection department: "The White 3000 is exactly engineered to our needs. It hauls twice as much load, covers twice the territory, requires two less men to load."

With packer-type body, open dump or with detachable bodies, the White 3000 is the modern truck for public service.

LOOK INTO THIS NEW KIND OF TRUCK for public garbage and refuse collection. It's the most modern kind of truck for efficient, economical service . . . today . . . and for years to come.

Its outstanding maneuverability saves driver time and driving time. It saves loading time . . . permits larger capacity bodies . . . longer routes. There's cab room for the collector and two helpers.

Find out from your White Representative how the White 3000 adds efficiency to your operations . . . adds economy.

THE WHITE MOTOR COMPANY • *Cleveland 1, Ohio*

For more than 50 years the greatest name in trucks

Tips its cab to service

PUBLIC WORKS

FEBRUARY 1952
VOLUME 83 • No. 2

• *TAR plant mix was used for resurfacing at Lansing airport.*

Surfacing Methods FOR TWO MICHIGAN AIRPORTS

L. C. ANDREWS,
Chief Engineer,
Michigan Board of Aeronautics

SUBSTANTIAL improvements at the Capital City Airport, Lansing, and the Owosso Airport at Owosso, Michigan, were completed in October and are now in use. The Capital City Airport, established in 1920, is now one of the state's busiest air terminals with 6,000 movements per month, including 75 instrument approaches, 100 military planes and 80 itinerant planes. These are average figures for a 16-hour daily period.

The original paved runway was built in 1938 under the Works Progress Administration. It consisted of a tar prime coat and a tar double seal coat over a gravel base. Several seal coats have been applied since 1938, as routine maintenance.

The airport's East-West landing strip and runway was built in 1948 by the Wright Construction Company, Williamston, Michigan. This was a plant mix job using Tarvia road tar, T-12, as the binder. The strip is 5,000 feet long and 120 feet wide. It has been in constant use since construction and is in fine condition. Recently a jet plane landed and took off from this runway without difficulty.

The 1938 runway was beginning to show signs of distress, due to lack of strength, so it was decided to add a new top to it this year, using the existing runway as a foundation. Work on the improvement of the runway started September 11, at which time a wedge and binder course was laid. Next a 2-inch base course was placed with a Jaeger paving machine. This was rolled with a 10-ton tandem roller.

Details of Surfacing

The base course was topped with a layer of Tarvia road tar, T-12, bound plant-mix, 1½ inches thick, laid and rolled. This surface was sealed with an application of ¼ gallon of Tarvia road tar, T-10, per square yard. This was covered with coarse white sand shipped from Drummond Island. The covering material was rolled in place with a rubber tired roller.

The Tarvia road tar, T-12, plant-mix was manufactured and laid by the City of Lansing, under the direction of Glenn P. Manz, Director of Public Works, and his assistant, Collins Thorton. The Construction Engineer for the Michigan Department of Aeronautics was Robert Peckham.

The new runway at Lansing gives the Capital City Airport two excellent takeoff and landing surfaces suitable for all classes of aircraft. The recently completed project runs NE-SW and is 4,200 feet long and 120 feet wide. Its construction was financed jointly by the CAA; the City of Lansing; and the Michigan Department of Aeronautics. The cost was $110,000.

The Owosso Airport construction comprised a paved runway and landing strip each 3,300 feet long and 75 feet wide. This job consisted of a tar plant mix, using RT-12 as a binder, laid two inches thick over a gravel base. In this case the mixing plant was located in Flint, Mich., and the mix was hauled 27 miles to the job. CAA specifications were used throughout.

The Wright Construction Company of Williamston, Mich., was the contractor on this job which was completed under the supervision of Robert Brewer of the Brewer Engineering Company of Owosso, Mich. The project was financed jointly by the CAA; the City of Owosso; and the Michigan Department of Aeronautics at a cost of $108,000.

● *EIGHT new filters shown under construction at the Fort Worth plant. Old plant units are at upper right.*

Filter Stone and Underdrain Specifications and Placement

W. S. MAHLIE and NORMAN G. WINDER,

Superintendent, Water and Sewage Treatment, Fort Worth; and Captain, MSC, USAR, formerly Engineer, Texas Vitrified Pipe Co., now on active duty.

LIKE many other cities in the Southwest, Fort Worth, Texas, has had an exceptional growth over the past ten years. Municipal services have been taxed to the utmost. Water and sewage treatment facilities have been greatly expanded, but no one could foresee or predict the actual rate of growth, and the result has been that the expanded facilities have again become overloaded.

This was especially the case with the sewage treatment plant. Built originally in 1924 to handle a flow of 7½ mgd of domestic sewage, it was enlarged in 1928, in 1935, in 1940 and again in 1947. The 1947 enlargement provided primary treatment for 30 mgd, of which 26 mgd is domestic sewage and 4 mgd is screened and settled packing house wastes, but secondary treatment for only 12 mgd. The present program provides secondary treatment for the remaining 18 mgd.

Unusual Design Features

The Fort Worth Plant is somewhat unusual in that the sewage, after passing through a Jeffrey mechanically cleaned bar screen, and mechanically cleaned grit channels, is pumped through primary settling tanks (reconstructed Imhoff tanks) and is then aerated with diffused air for 2.25 hrs. using 0.15 cu. ft., of air per gallon. Following aeration, it is settled in secondary clarifiers for about 2.6 hours. It is then applied to trickling filters and again settled about 2 hours in the final tanks before discharge to the river.

Based on our 25 years observation of the performance of the existing filters, and the fact that our sewage contains large quantities of screened and settled packing house waste and industrial wastes containing small quantities of chromium, our engineers felt that the trickling filter type of treatment was best adapted to our conditions. The short period of aeration and secondary settling before application to the filters, enables us to treat rather heavy loads and absorb the shocks with a minimum of disturbance to our treatment.

The work includes, in addition to the treatment units, extending and moving the levees which protect the plant against flood waters; building about a mile of roadways and gutters; and constructing certain bypass and outfall lines.

The New Filters

The eight new trickling filters are each 8.4 ft. in depth, with a design loading of 711 pounds of BOD per acre foot per day. The surface application rate is 3.125 mgad. Distributors are 4-arm Infilco, so designed that two arms will carry the lower rates of flow. Floors slope six inches from the outside wall to the center. The effluent channel is 30 ins. wide, and slopes 0.5%. Gates are provided for flooding the filters, if desired. Underdrains are Translot blocks, manufactured by the Texas Vitrified Pipe Co. and meet ASTM Specifications C 159-45T.

The filters have an annular air vent channel, 5 inches deep and 16 ins. wide. This is formed by laying cover blocks on top of the end filter

blocks, the other end resting on a shoulder built on the side wall. These cover blocks have slots on the bottom side. Every 18 degrees a cover block has a bell on the top to take an 8-in. vitrified tile vent pipe.

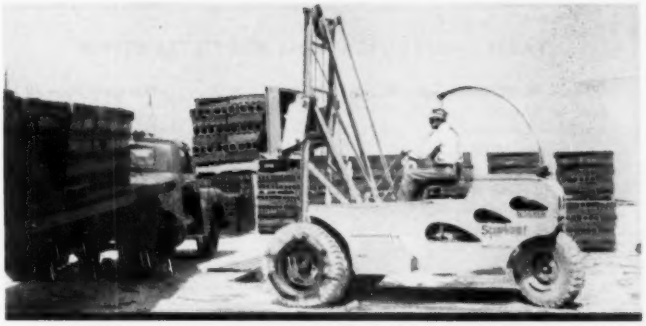
Originally it was intended to cover the effluent channel with long filter blocks, but we were concerned whether these blocks would support the filter stone, and as a consequence, a substitute cover was made. Pieces of 3-in. vitrified clay tile with plain ends, 40 inches long were filled with concrete. Two ½-inch reinforcing rods were placed inside so that they were on the bottom side when the tile was laid. These tile were spaced a minimum of ¼ in. apart. Due to warping, the tiles are not uniformly straight and in some cases the space between adjacent tiles was slightly more than this. The ends overlapped the channel 5 inches on each side and were imbedded in cement mortar.

There are three new radial flow secondary settling tanks. These are 95 ft. in diameter, 14.67 ft. center depth and 11 ft. sidewater depth. These are equipped with Process Equipment sludge collectors, with continuous sludge removal by centrifugal pumps. The tanks provide a detention of 2.59 hours and the overflow rate is 847 gals. per day per sq ft. of surface area. The three final clarifiers are duplicates of the secondaries.

The two new sludge digesters reinforce the capacity provided by five older units. The new tanks are 75 ft. in diameter, with a center depth of 29 ft. and a side depth of 24 ft. They are equipped with PFT floating covers, and with heat collection and utilization equipment. Sludge pumps will be 165 gpm Marlow, variable stroke.

Placing Underdrains

The methods of placing the underdrain blocks and the stone has attracted some attention from engineers and contractors. The floor slab of the filters was poured in the normal manner using drag line and bucket with ready-mixed concrete. The walls were formed by using special 10-ft. by 24-ft. circle segment forms made up of channel iron and wood and lined with masonite. As each pour of 160 ft. was completed, the forms were removed and placed for the next section pour. One 24-ft. section was left open to allow entrance for the construction of the center pier, and the placing of the filter drains and stone.



● ***FILTER** blocks were shipped on pallets and handled by a fork truck.*

● ***PLACING** the blocks on a ½-in. bed of dry sand-cement mortar.*

● ***FILTER** floor completed; ready to place the channel covers.*

● ***EFFLUENT** channel was covered with reinforced 8-in. clay pipe.*

TABLE I—SPECIFICATIONS FOR FILTER STONE

Wear, L.A. Abrasion Test, ASTM C131-47	*Not more than 30*
Sodium Sulphate Test, 20 cycles, ASCE, Manual 13	*Loss not over 10%*
Apparent Specific Gravity, ASTM C131-47	*Not less than 2.60*
Absorption, ASTM, C127-47	*Not more than 1%*
Organic Matter	*None*

No soil or clay will be permitted in the stone. The broken or crushed stone will be produced by one operation of the crushing and screening plant. Recombining of material will not be permitted. The stone shall be crushed or broken to the following grading, using square openings and computing percentage passing by weight: 4-inch, 100%; 3½-inch, 90% to 100%; 2-inch, not to exceed 10%; and 1½-inch, not to exceed 2%.

Since the filter blocks were manufactured at Mineral Wells, Texas, they were transported to Fort Worth by trucks, a haul of approximately 55 miles. The blocks were stacked on wooden pallets 3 ft. by 3 ft. as they were loaded on the trucks. Each pallet carried 7 square yards of blocks and there were 18 pallets to a truck load. The pallets were unloaded with a two pronged fork attached to a "scoopmobile" and placed in the proximity of final setting and convenient to placing by the filter block crew.

A 5-man crew placed the blocks on a ½-in. bed of 1:9 dry sand-cement mortar mixture at the rate of 2200 blocks, or about 370 square yards per day. At the end of each day the blocks placed were sprayed with water to allow the sand-cement cushion to set.

Placing the Filter Media

Specifications for the stone are shown in Table 1. To avoid a repetition of previous experiences (Public Works, August, 1951), our specifications for placing the stone were rather rigid, as follows.

"In the placing of filter media, care shall be taken to prevent breakage and segregation of the media and to eliminate fine particles getting into the filter. Media shall be placed in the filter using a belt conveyor, by boxes using a crane boom or by other method approved by the Engineer, which method does not require traffic of any type over the top of stone placed in the bed, whether such traffic be directly on the stone or on mats placed on top of the stone. As a step immediately prior to the final placing operation, it is required that the media be passed over a suitable screen with not less than 1-in. square effective opening. The purpose of this final screening shall be the elimination of fine and broken particles which may have gotten into the media by any cause at the source, through transporting, or handling of the stone.

Care shall be taken in the placing of the initial layer of media so that the underdrain blocks will not be broken or otherwise damaged. In the unloading from the conveyor or from boxes, dropping of the media from height which will cause breakage or segregation of the stone will not be permitted.

The surface of the media shall be levelled using a Morman board, wooden drag or by other method approved by the Engineer, which method shall prevent breakage of the stone.

The hauling of the stone to the filter in trucks and dumping directly therein and the use of bulldozers or heavy equipment travelling over the stone for spreading, leveling or other purposes will be prohibited.

The contractor's attention is particularly called to the provision of this section of the specifications requiring care in handling of filter media and prohibiting the use over the surface of the stone of trucks, bulldozers or other heavy equipment."

The stone was delivered from the quarries at Chico, Texas, in hopper-bottom cars to a siding about 2 miles from the plant site and unloaded by dumping on an inclined conveyor belt which carried the stone to a vibrator screen. The screened rock dropped into a hopper, and by means of gates was loaded directly into boxes on trucks and then transported to the filters. These boxes were constructed of channel iron and oak timber and had a bottom trap door through which the stone was released to the filter. The boxes were 3 x 3 x 6 ft. in dimensions. Three boxes constituted a truck load. When received at the filter a drag line equipped with a pickup line and a tripline placed the stone where required. As the stone was released through the doors in the bottom the boxes were slowly raised to allow the stone to spread with a minimum of agitation.

The stone was received at the screening plant at a rate of 14 carloads per day. It required approximately 20 minutes for a truck to make a round trip from the screening plant to the construction site, and by using 5 trucks a schedule

(*Continued on page* 110)

● ***STONE** was screened at a siding and loaded into boxes.*

● ***CRANE** swings boxload of stone from truck to filter.*

● ***TRAP** door on box opens to place stone in the filter.*

Forecast: SNOW

HENRY LIEBMAN,
Director of Operations
Department of Sanitation
New York City.

EVERY city official charged with the responsibility of keeping streets and highways open for traffic, views the advent of the winter season with some trepidation if his municipality lies in the region where snow falls. It is paradoxical that this soft white stuff which gives so much pleasure out in the country is a menace in the city. Deep snow causes traffic and transportation tie-ups; accidents; hampers delivery of coal, oil and foods; delays fire-fighting equipment, ambulances and doctors; prevents telephone, gas and water companies from answering service calls; and interferes with garbage and other waste collection. City dwellers as a rule have only small quantities of foods and fuels on hand, depending on daily truck distribution for necessities. It is easy to visualize the serious situations that could develop if streets were not cleared quickly enabling normal commercial life to resume.

Every winter the Department of Sanitation of the City of New York faces its obligation of maintaining approximately 5,400 miles of street in a passable condition at all times. Heavy snowstorms deposit millions of tons of snow on about 90,000,000 sq. yds. of street pavements, presenting enormous removal problems. In order to be ready to tackle the job expeditiously and effectively, the department must plan and prepare months ahead in much the same manner that a military organization would undertake the planning of a coming campaign. Activities commence in the spring with the inventory taken on April 15th and continue on throughout the summer and into the fall. The preceding winter's performances of men, materials, methods and machines are reviewed, defects and deficiencies are searched out for correction and new or revised plans of procedure prepared.

The First Line of Defense

Attention is directed at one of the first lines of defense, the snow fighting machines, for they get a bad beating in this tough service. After being inspected and, where necessary, repaired and overhauled, any defective and worn parts removed and replaced, they are put away in mothballs for their next season. Conferences are held during the year between the engineers, operating personnel and manufacturers to discuss new and better equipment; plans and specifications are drawn up and, when moneys are available, contracts advertised and let for their purchase.

Our snow equipment usually starts out as a minor modification of standard construction equipment but soon comes to grief, requiring major revisions or complete redesign. Maneuverability is necessary to cope with restricted working areas and to reduce to a minimum interference with traffic. High speed and high capacity must be features of the units to handle the heaviest falls, to move about from location to location without delay and to keep the hauling truck fleet in continuous motion. Ruggedness and power must be built into the machines to withstand the abuse exacted by frozen snow, ice, foreign objects, such as ash cans and the like buried in drifts, protruding manholes, curbs and broken pavements. Dependability is important as storms may occur at any time, in quick succession, or last the entire winter. Comfort and safety are

● ***NELSON** salt and snow loader, one of 35 owned.*

● ***LOADING** up a salt spreader with a Payloader.*

necessary requirements to protect the operator. All equipment now being purchased by the department must be furnished with cab heaters, substantial bumpers and flashing warning lights.

New York's Equipment

New York City has about 1,000 pieces of equipment, whose function is exclusively snow fighting. In addition there are 2,000 plows which can be attached to collection trucks, wreckers and flushers, 1,000 trucks suitable for hauling snow, and 46 wreckers for moving disabled vehicles. Among the major pieces of snow fighting machines are:

41 Sicard blower type snow loaders mounted on FWD chasses.

61 Snogo blower type snow loaders.

65 Joy conveyor type loaders mounted on White chasses.

35 Nelson conveyor type snow and salt loaders.

425 International Harvester crosswalk plows.

200 International Harvester crosswalk tractors with Trojan angling plows.

101 Good Roads salt and sand spreaders.

A contract has been let recently for 38 additional sand and salt spreaders of 9-yard capacity. These will be controlled from the cab, requiring only one man for operation. Present units require two men for operation, one in the cab driving, and the other on the rear regulating the amount spread. When necessary to clear severe cases of impacted ice and snow, 81 bulldozers mounted on Caterpillar tractors are diverted from the landfills.

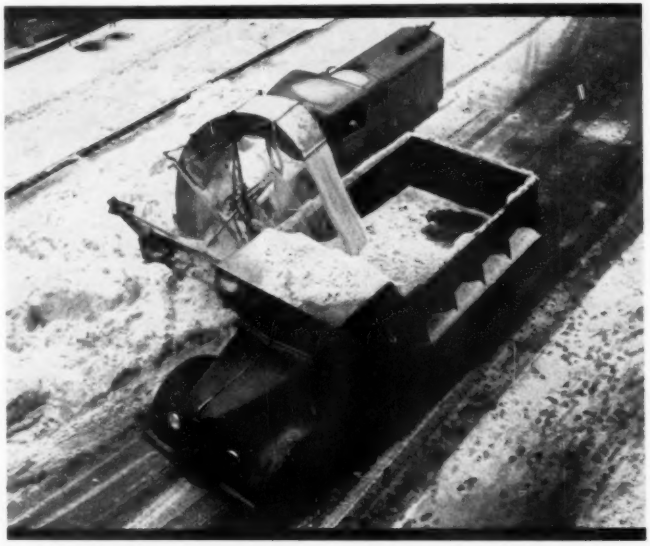
Supplies and Repair

Fighting snow uses up a lot of supplies which must be replenished in the summer and fall. Approximately 40,000 tons of salt are purchased and stockpiled for use during the winter. Cinders are collected and stored for use on bridges and hills. Shovels, blades, brooms, skid chains, hoists and hundreds of other small items and spare parts are ordered and stored for future use. Because of the variety of sizes, the amount of repair work, and the need for a dependable supply, the Department has found it advisable to establish its own skid chain shop and has developed its own equipment for their manufacture. Chain is purchased in bulk, cut to length and fabricated in this shop. To be on the safe side, three sets of chains are provided each vehicle at the start of the season.

Storage of salt is a problem to which the Department has given a lot of attention. Most of the salt is now stockpiled in garages, which is an unsatisfactory arrangement as it uses up available vehicle storage space and may be causing damage to the structure and equipment by corrosion. Salt is also stored outdoors in open bins covered with tarpaulins. A full scale test is being conducted to determine if salt can be successfully stored in large concrete silos, using former coal bins for the experiment. At present salt is loaded into the spreaders by means of portable conveyor type loaders. Gravity feed from concrete overhead bins would be a much more satisfactory method of operation. Main storage depots with facilities for barge delivery for the full winter's requirements are projected for strategic points throughout the city. Salt is used not only to combat icy conditions but also to reduce the volume of snow that must be removed. The salt bores through the ice and snow and on reaching the pavement the salt solution spreads and breaks the bond between the snow or ice with the pavement, allowing for ready removal by plowing, resulting in a fairly clean surface.

Besides machines and materials, the methods of snow fighting procedure are restudied. To prepare more efficient snowfighting plans, the experiences of the past winter are reviewed and modifications of the procedure are drawn up and incorporated in the Snow Removal Manual. This document of ninety pages is the "Bible" of snow removal for the City of New York. It contains methods and procedures for dealing with snowstorms which are the results of years of study and experience. Coupled with this study are the necessary planning and instruction activities. During the year preliminary planning work is done on such items as laying out of plow routes, sanding routes and salting routes; designation of waterfront disposal points, and of sewering points. Training schools have been established at the Sanitation Training Center in Brooklyn and in the five boroughs. Courses of instruction for the new men and refresher courses are given at the Center and practical demonstrations of the equipment are given at the borough schools.

During the snow season, the United States Weather Bureau furnishes the Department with predictions as to approaching storms, but freak storms do occur without prior warning. To meet these emergencies, a snow season mobilization plan for personnel and equipment is instituted about November 15th. Collection schedules are rearranged, shifting about one-third of the force to night work and designating it



● ***CLEARING a deep windrow with a Snogo blower type loader.***

"The Night Plow Organization". The other two-thirds remain on the day shift. Police call cards for officers and men assigned to the Night Plow Organization are filed by the individual at the Police precinct nearest his home. In the event that snow falls on a Sunday or a holiday night, in addition to radio and telephone notices, the local precincts are requested to send patrolmen to notify employees to report. The personnel of the Night Plow Organization is changed every two weeks at which time the cards are reshuffled.

This distribution of personnel insures continuous coverage so that no matter what time of day or night a storm breaks the Department is ready to tackle it. To be prepared on Sundays and holidays, plows and chains are attached to those trucks which would be used for plowing in case of a storm occurring on those days. Past experience reveals that the storm warning information is fairly reliable as to the time of starting and the duration of the fall, but that the intensity and amount of the fall is difficult to predict. Consequently, when a storm prediction is received, the organization must be ready to deal with snowfalls of any intensity. Snow falls of intensities up to three inches per hour can be handled without too much difficulty but when this intensity is exceeded for any appreciable length of time, troubles mount since at those rates snow accumulates faster than it can be readily removed or plowed aside.

Help by Hiring

The Department does not have sufficient personnel or equipment to cope with the severest storms, therefore, provisions are made in the early fall for enrolling emergency labor and trucks and the hiring of outside contractors to do a portion of the snow removal work. Registration of the emergency laborers and emergency drivers is carried on at the various garages and section stations of the Department. In addition some personnel of other departments of the City normally engaged in street, highway, water and bridge operation are utilized. Approximately 24,000 personnel are used in combating severe storms. Of these, 9,500 are Department of Sanitation employees, 9,000 are emergency laborers and chauffeurs, 3,000 are hired equipment and contractor personnel and 2,500 are from other City departments. Invitations are extended to owners of contractor's equipment such as dump trucks, winch trucks, bulldozers and truck cranes to register for snow removal work and when used such equipment is paid for at rates previously determined by the Comptroller of the City of New York. Approximately 3,000 hired units are utilized during large storms.

The forecaster's prediction of snow puts into action this carefully prepared plan of operation. Teletype warnings and orders are sent to all locations directing work to start. Supervisory personnel report to their assigned locations; spreaders are loaded with salt, sand and cinders; snow equipment motors are turned over to insure readiness for a prompt start; skid chains and plows are attached to all serviceable collection trucks not on collection and to flushers and wreckers.

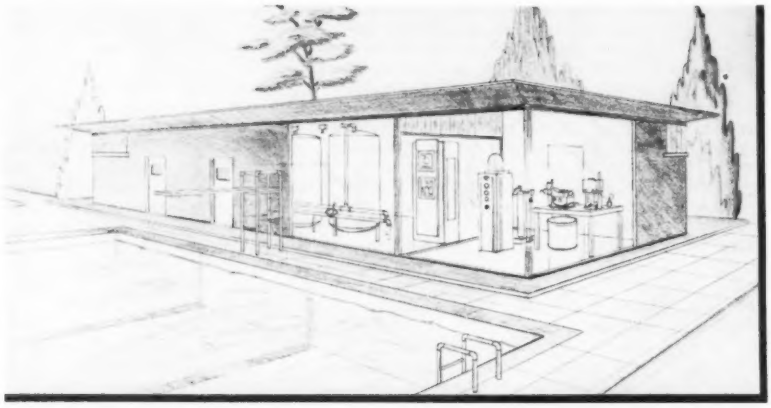
When the snow starts to fall and stick, spreaders are dispatched to spread cinders on the bridges and salt on the main traffic arteries, bus routes, and main thoroughfares and then salt on the local streets. In the past, snow brooms were used on bridges but this did not work out satisfactorily since the thin layer of snow left would freeze and form an icy coating and the bristles would load up with snow. The brooms have been withdrawn from service and sold. Salt is not used on bridges or concrete pavements to avoid possible corrosion or scale damage. About 4,000 to 5,000 tons of salt are spread during a storm in which the fall is six to eight inches in depth. Spreaders continue their operation throughout the storm to prevent development of icy street conditions and to reduce the amount of snow to be hauled away or sewered. Applications range from $\frac{1}{8}$ to $\frac{1}{4}$ pound per square yard. Rock salt was first used in 1935 in midtown Manhattan and its use has been expanded city-wide since. It has several advantages over abrasives, particularly in the fact that it presents no removal problem, does not clog sewers, and is not blown away.

If the snow fall continues to such an extent that it can no longer be handled by salting, plowing operations are started. Crosswalk plows are sent out to clear intersections and crosswalks and bus stops. Flushers and those collection trucks which were standing in the garages are sent to their assigned routes to commence plowing. Refuse collection is suspended and all trucks on collection are called in, equipped with skid chains and plows and diverted to snow plowing. Each plow is assigned a definite route ranging from $1\frac{1}{2}$ to 5 miles in length, depending upon the topography, traffic, location and other factors. The routes are laid out that the circuit

(*Continued on page 99*)

● ***CROSSWALK plows clear snow at intersections.***

● ***HEAVY plowing is done by sanitation trucks.***



● ***ARRANGEMENT of chlorinating and filtering equipment, as shown in the accompanying artist's sketch of the operating end of a swimming pool.***

How Chlorination Improves

A. E. GRIFFIN,
Technical Service Director,
and
HAROLD LANDSHOF,
Swimming Pool Division,
Wallace & Tiernan Co.

DURING the last three decades the popularity of swimming pools has increased enormously. Today thousands of pools are in use all over the country in private homes, in clubs, and in municipal parks and playgrounds. The reasons for such a growth in popularity are not hard to find—improved pool design, more efficient pool operation, and the use of chlorine to keep the water sterile. All of these have played major roles.

Chlorination has been especially valuable in the elimination of bacteria which would cause discomfort to the swimmer. With controlled chlorination, wherein chlorine is applied effectively in the proper quantities by the proper equipment, pool owners and operators have been able to ensure their guests and patrons a pure, sparkling water free from troublesome bacteria.

There are three principal types of swimming pools: *The fill and draw pool* in which the pool is filled with fresh water, used for a time, emptied and then refilled; the *flow through pool* which is supplied by a continuous flow of fresh water; and the modern *recirculated pool* wherein the water is recirculated, filtered, and sterilized with the addition of only enough fresh water to take care of evaporation and other losses. In most cases, experience has shown that the recirculated pool, while somewhat higher in original cost, offers the greatest economy in operation and provides for the highest water quality.

In addition to the man-made or artificial pools, there are many natural bathing sites utilized as pools. Such locations, when properly selected and supervised, can be provided with modern equipment to give full bather protection while still retaining the advantages of natural out-door surroundings.

Swimming pools can be built in a variety of shapes, sizes, and types to accommodate almost any budget, or to meet requirements of location, purpose and particular taste. In building any pool, some of the questions which must be answered are: The relative advantages of the various types of pools for a particular need; the type of construction to be employed; the location of the inlets and outlets; the merits of indoor vs. outdoor pools; bath-house facilities; heating; lighting; financing; site selection; pool size; operating equipment; and local and state health regulations.

All of these factors should be considered and handled by competent engineers, architects, health officers and builders for best results.

A vital factor in pool design and operation is the protection of pool users against harmful bacteria that cause eye, ear, nose, and throat infections, skin irritations, and similar disorders.

Chlorination, proven by use on drinking water supplies, industrial water supplies and on thousands of pools throughout the world, is one of the most effective methods known for obtaining such protection. This protection is obtained by destruction of the harmful bacteria in the pool water by the action of chlorine—a process known as disinfection.

Disinfection can be assured with chlorination because it is possible to maintain a properly controlled chlorine residual in the pool water at all times. This residual is present in every drop of water and will counteract dangerous pollution caused by bacteria as rapidly as they are introduced.

Today the pool owner has to consider (a) the type of residual desired and conditions that affect it; (b) the form of chlorine required to obtain the residual; (c) the point of chlorine application for most effective results in maintaining the residual; and (d) the type of equipment needed to obtain the desired residual.

Types of Chlorine Residual

When chlorine is applied to water a portion is immediately used up in the destruction of organic matter and bacteria, and in the oxidation of ammonia and other constituents in the water. The amount left over

is known as residual chlorine. This term by itself is inadequate because chlorine residuals may consist of free available chlorine alone, of combined available chlorine (chloramines) alone, or of a combination of the two. **Free available chlorine residual** is the form of chlorine that is free to kill bacteria quickly, to oxidize ammonia and to kill or prevent the growth of algae. **Combined available chlorine (chloramine) residual** is a form of chlorine combined with ammonia or some nitrogenous organic compound. In this form chlorine is available to kill bacteria, provided the contact time is sufficiently great, but its action on bacteria, algae and other

Swimming Pool Operation

● ***THERAPEUTIC** pool requires dependable water treatment.*

constituents in the water is delayed. Some algae can grow in the presence of combined available chlorine residuals.

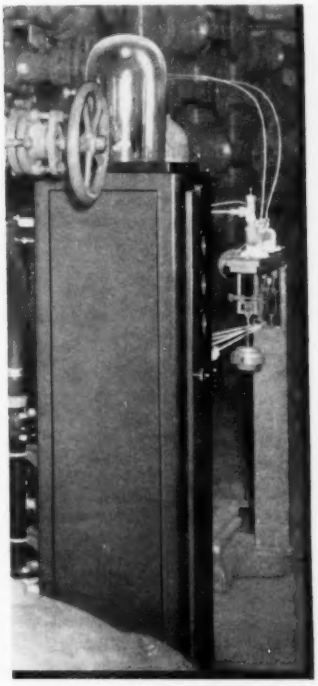
Each of the residuals described has particular advantages. Most experts agree that free available chlorine residuals are advantageous as compared to combined available chlorine residuals by virtue of their ability (1) to kill harmful bacteria in three minutes or less—a characteristic highly desirable in a swimming pool; (2) to prevent the production of nitrites and to destroy any that may be present; (3) to kill practically all types of algae; and, (4) to oxidize iron to a form that can be easily filtered. The first and second points mean a bacteria-free water while the third and fourth points insure a clear water. For effective results, the free chlorine residual should not drop below 0.4 ppm, and a practical upper limit for normal operation appears to be in the order of 2.0 to 3.0 ppm. The pH value should be maintained between 7.2 and 7.8.

The idea that the maintenance of free available chlorine residuals above 0.6 ppm may cause eye irritation has small basis in fact. According to some of the leading researchers in the swimming pool world, eye irritation is caused by the presence of excess alum in the water or by the fact that the pH of the water is on the acid side of neutrality, i.e., below pH 7.0.

The clarity, sparkle, and color of the water in pools where free available chlorine residuals are maintained at the proper level are outstanding. Dull water can usually be attributed to suspended matter such as algae and bacteria which interfere with the passage of light through the water. The intense power of free available chlorine prevents the growth of such algae and bacteria. This form of chlorine also oxidizes and precipitates both organic and inorganic material. The result is a clear, sparkling water, with a beautiful blue cast or shade.

Compared to free available chlorine residuals, chloramines are slow acting compounds. For example, it has been reported that the killing time for chloramine residuals is 30 or more times longer than that of free chlorine residuals under comparable conditions. This slowness of combined available chlorine residual action may mean a dangerous delay in effective sterilization.

Thus free available chlorine residuals are preferred for most swimming pool installations. However, in the presence of large quantities of organic material such as in out-door, earth-bottom pools, or where there is poor circulation, combined available chlorine residuals may be required.



● ***CHLORINATOR** installation for a swimming pool.*

Controlling the Residual

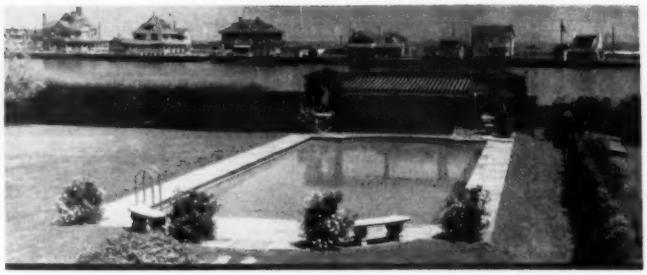
Control of the residual in a swimming pool depends upon a variety of factors including: the continuity of chlorination; the frequency of testing for the residual; the points of sampling; the amount of organic matter present; the pH (relative acidity or alkalinity) of the water; the intensity and duration of sunlight; the bathing load; the turnover rate, and the continuity of recirculation and filtration.

The intermittent or batch application of chlorine to a swimming pool is never a satisfactory procedure. This is because (1) the residual will be high at the time the chlorine is added; (2) will be low between additions; and (3) proper mixing cannot be obtained. The results of such a procedure leads to higher than necessary residuals at the time of chlorine application and the growth of bacteria between such applications. Lack of mixing leads to uneven distribution of chlorine, thus producing irregular and unsatisfactory results, both from a bacteriological and an esthetic point of view.

The benefits of recirculation and filtration over the entire 24-hour period cannot be emphasized too much. Usually the chlorine dosage can be lowered during the periods of non-use, provided recirculation is continued. Such a procedure allows the pool to recover from the load of the previous day so that each morning the pool will be sparkling clear and the residual will be well above 1 ppm, the point of maximum efficiency.

Frequency of testing for residual chlorine content is important. No exact testing schedule can be given for all pools, but it can be said that one test for chlorine content daily is entirely inadequate. At some pools, where the bathing load is heavy, it may be necessary to make the test at half-hour intervals; at another, a test every two hours may suffice. In any case a sufficient number of tests should be taken to show the trend of the residual. If it is dropping, more chlorine should be added, and vice versa. By the use of a residual recorder, a continuous record can be obtained of both the residual and its trend.

The object of swimming pool chlorination is to produce a residual throughout the pool. Naturally the residual will be high in front of the water inlets. Therefore, samples should not be taken from this point. A point, or points, should be selected where the water being returned to the pool has had a chance to mix with the water in the pool. Also, the sample should be collected from below the surface, away from the influence of any dust that may have been blown into the pool. Due to dust, a surface sample may not be a fair index to the true quality of the water in the pool. Samples collected near the outlet of the pool are usually representative of the water in the pool.



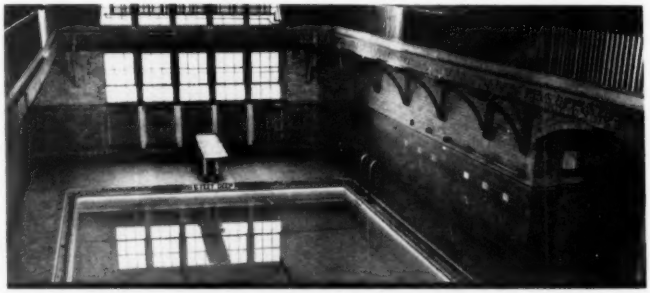
● *ATTRACTIVE outdoor pool improves water clarity by chlorination.*

Organic matter in swimming pool water always reduces chlorine residuals. In other words, the chlorine is "used up" by reacting chemically with organic impurities. The amount of chlorine destroyed in this manner will vary directly with the amount of organic matter present.

Filters, either the sand or diatomite type, are employed in the recirculation system to remove organic material. Water works alum is ordinarily used as a coagulant with sand filters, whereas no coagulant is needed with the diatomite type. As the water passes through these filters, the suspended material, consisting largely of organic substances, is removed. This lowers the demand for chlorine and makes it easier to maintain chlorine residuals.

pH—pH expresses the degree of acidity or alkalinity of water in numbers ranging from 0. to 14.0. At pH 7.0, the water is neutral. Above pH 7.0 the water is alkaline. Below this point it is acid. In general, when the pH value drops very much below 7.0, there is likelihood of causing irritation of the eyes and nose. For this reason and because irritation, due to low pH values, can be minimized by keeping the water slightly alkaline, it is desirable to maintain the pool between pH 7.2 and 7.8.

When chlorine is applied to water it reacts to form hypochlorous acid (HOCL) and hydrochloric acid (HCL). These acids react with the natural alkali in the water at a rate of 1:1.2, chlorine to alkalinity. This means that if the water is recirculated and rechlorinated with a minimum of makeup water being added, the pool water will tend to become more acid (i.e., the pH will drop) with each complete turn-over. This can be corrected by adding the equivalent of 1.2 ppm alkalinity (as $CaCO_3$) for each part of chlorine used. In a swimming pool, this is usually accomplished by adding a solution of soda ash or caustic soda by means of a chemical solution feeder. It is therefore an easy mat-



● *PLEASANT swimming conditions result from good operation.*

ter to maintain the pH at the recommended range of 7.2 to 7.8.

Sunlight is a powerful dechlorinating agent and often accounts for rapid loss of chlorine, particularly on the surface or in the shallow end of the pool. This loss is quite marked in the older pools where the inlets are at the surface and concentrated at the shallow end. In pools of this type, it has often been impossible to maintain a residual throughout the pool over the entire day. This condition can be improved and, in some instances, completely remedied by increasing the number of inlets and relocating them below the water level. However, even with such improvements it may be necessary to apply chlorine at a rate of 10 ppm or more based on the amount of water recirculated during peak bathing loads and during the hours of maximum sunlight.

The bathing load refers to the number of people in the pool at any given moment. The more people in the water, the greater the chlorine demand and the more difficult it becomes to maintain the desired residual. The application of 10 ppm or even more, based on the recirculation rate, may be necessary to maintain the desired residual during heavy load periods.

The turn-over rate refers to the number of hours required to recirculate the water in the pool. It is usually recommended that the water in the pool should be recirculated at least three times daily. If this rate can be increased to four times daily, results will be much better. The burden on chlorinators is lessened as the turn-over rate is increased. Generally the chlorine demand is lowered and chlorination thereby becomes more efficient.

Forms of Chlorine

Having carefully considered the type of residual desired, and the factors that will affect that residual, the operator next must decide what form of chlorine should be used to obtain that residual.

The chlorine which is used to produce either a free available or combined available residual comes in powder, solution, or liquid.

The **powder forms of chlorine** are known as calcium hypochlorites, and are available on the open market under various trade names. These powders must be dissolved in water and the solid matter removed by sedimentation.

Solutions of hypochlorite are marketed either under trade names or simply as sodium hypochlorite. Inasmuch as this form of chlorine contains a great deal of water it is usually distributed by a local manufacturer because of high shipping costs. The sodium hypochlorite is generally diluted with water. Both sodium and calcium hypochlorite solutions may be applied to the water of a pool with a chemical solution feeder.

Liquid chlorine is the element chlorine (normally a gas, but for the sake of economy and ease of handling is reduced by pressure to a liquid form) which regasifies when the pressure is released. It is available in steel cylinders and is the most economical form to use. It is applied by means of a chlorinator.

Points of Application

After deciding on the type of residual to be carried, and the form of chlorine to be used, the pool operator must consider the point of application. The location of the point of application will depend on the type of pool, whether recirculating, fill-and-draw, flow-through, or a large outdoor body of water.

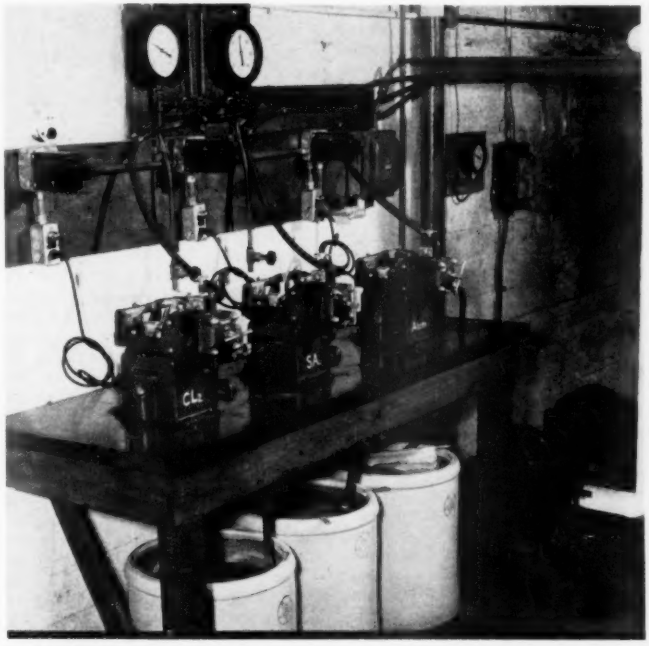
The recirculating pool we will assume to consist of strainers, filters, heater, pump, valves and, if necessary, a chemical feeder or two, all located between the outlet and the point of return. With these assumptions in mind, there are two methods of application, pre-chlorination (before filtration) and post-chlorination (after filtration), that can be used for this type of pool.

Water that drains from the pool contains lint, hair, skin particles, and dirt. The lint, hair, and some dirt and skin particles are removed by the strainers. With pre-chlorination, chlorine is applied between the strainers and the pump. This prevents the accumulation of bacteria, algae and the build up of mud balls in the filter.

When sand filters are used, a coagulant is generally added; for example, alum plus some alkali such as soda ash. The coagulants form a jelly like curd which forms a mat on top of the sand filters to collect any material too fine to be retained on the screens and hair catchers.

Occasionally, post-chlorination is used, that is the chlorine is applied between the filter and the pool. In

(*Continued on page* 93)



● ***THREE feeders control the rate of application of alum, soda ash and hypochlorite solutions for water treatment at this installation.***

SPECIAL EQUIPMENT SPEEDS MICHIGAN MAINTENANCE

BURLEIGH R. DOWNEY,
Maintenance Engineer,
Michigan State Highway Dept.

AS a premise to the discussion of modern maintenance practices in Michigan, let us pause for a moment and review the problems which the Michigan State Highway Department faced at the conclusion of World War II. Our highways took terrific punishment during those war years when our churning factories were setting production records and earning for themselves the title, "Arsenal of Democracy". The highways then, as now, were an integral part of those production lines. Due to the heavy pounding our roads took, coupled with the fact that construction was reduced to an absolute minimum, we found our highways to be highly inadequate for the tasks assigned them. Following the war years, rising construction costs and an inadequate tax structure forced us to more extensive maintenance in order to preserve the existing roadways.

Let us now look more closely into the specific problems which faced our Maintenance Division.

With more cars on the road traveling at higher speeds new problems of safety arose and we began extensive re-signing and pavement marking programs. Tree trimming and brush cutting programs to correct poor sight distances and eliminate hazards were greatly accelerated. We began to resurface and salvage roadways which normally would have been retired or replaced.

The Answer: Machines

Also, we were beginning to be pinched by the ever-rising spiral of inflation. It became necessary to re-examine all of our maintenance operations and wherever possible to economize and mechanize. Yes, greater mechanization was the answer and equipment engineers joined with maintenance engineers to help solve these problems. Economy and speed of operation, along with a better job, were initial considerations, although we also became more acutely safety conscious and began to demand equipment that minimized danger to our employees.

We will mention some of the newer equipment used for maintenance operations in Michigan. Most has been manufactured by equipment companies but we have developed some ourselves. We will also comment about types of equipment for which we are still searching.

The hopper type, truck mounted, self-unloading sand spreader for ice control is one of the more recent developments. We have found that these units greatly reduce the cost of sanding operations. This is accomplished in several ways. The spreader is operated by one man, the driver, making possible a substantial reduction in labor costs. These sanders also carry a greater quantity of abrasive material which

● ***HIGH spots are removed with pavement planers.***

adds to economical operation. Another point which we feel is extremely important is their greater safety for our operating personnel. This point was impressed on us after one of our maintenance men was seriously injured while working with one of the old trailer-type sand spreaders. Lastly, and perhaps most important of all, these conveyor type sanders do a better job. We get a more even distribution of our sanding material and are able to do a more satisfactory ice control job in a shorter period of time.

Another piece of equipment found very satisfactory is the self-propelled transverse pavement joint cleaner. The machine consists of

● ***HERE is the machine that***

specially designed cutters powered by a gasoline motor. This one-man unit is mounted on a pneumatic tired carriage. Formerly this work was done with a plow type unit which was pulled by a tractor and was a two-man operation. Greater maneuverability in addition to economy makes this equipment practical.

And More Machines

We are also trying a new type of rubber joint filler which promises to reduce maintenance costs and at the same time do a more satisfactory job of pavement joint sealing. This filler reacts something like a rubber band. It expands and contracts keeping the joint filled, and at the same time sealed to the concrete slab, in all seasons of the year. Its non-extruding characteristic eliminates the necessity for re-

moving excess joint material in the summer months. It will reduce materially our fall and winter joint sealing operations. A heater which accurately controls the temperature of the rubber joint filler must be used. It is compact and portable. Although the material is more difficult to prepare for application, its permanence makes it economical.

Some of the municipalities in our state maintaining state trunklines report the successful use of truck end-loaders. This attachment allows a driver to load his own truck and has resulted in substantial saving in removing such materials as roadside trash and leaves. The equipment is very economical for loading litter resulting from street sweeping.

Roadside forestry operations have also undergone a modernization and mechanization program. The past few years have seen a tremendous increase in the use of power saws, and tree and brush cutting equipment. In Michigan we have found that the use of chain saws has greatly speeded our tree trimming operations and at the same time has resulted in a reduction in these costs from one-third to one-half.

The elimination of roadside weeds by the use of chemical spray is still another effort to accomplish savings by lowering mowing costs. We are using the chemical 2,4-D for this purpose, and expect that a substantial saving will be realized by the reduction of the amount of mowing required.

We hope also to control the growth of brush by spraying newly cut brush with a solution of 2,4-D or 2,4,5-T. The greater control of brush will increase the safety of highways by keeping sight distances clear and will improve the appearances of the roadside. At the same time better brush control promises to reduce ditch cleanout expenses and effect a more satisfactory drainage of the sub-grade. Our forestry crews operate from specially outfitted trucks which house compactly all of the many tools, saws, and winches used in the care of trees and shrubs. Our forestry activities have not, however, reached the degree of efficiency we know are possible. We are studying and experimenting with new equipment such as brush cutters and chipper-type brush disposal units. Power cutters promise to reduce greatly brushing costs and the chipper disposal unit may be successful in locations, especially municipalities, where brush burning operations are impractical. The chips from the disposal unit would be used on the highway roadside as a mulch.

Planing Pavements

The Michigan State Highway Department has also experimented with a bituminous pavement planer. Briefly, the machine operates by heating the bituminous surface to a workable temperature, then a planing device peels off the high spots leaving a uniform level road surface. Thus, pavements which ordinarily would require a resurfacing due to roughness may now be economically reclaimed. Material removed from the road surface during this operation may be used for filling ruts adjacent to the pavement, for surfacing driveway approaches, etc.

The post-war period found us greatly expanding our signing operations. To an accelerated program of our own was added an extensive Federal Re-signing project. The need for more modern methods became evident. The first attempt to increase efficiency and production was properly to train and equip sign crews. We then began to experiment with, and have successfully developed, pneumatically powered post-drivers. For this purpose we use a truck mounted gasoline powered air compressor (60 cfm.) and a light duty air hammer. The hammer is equipped with specially designed sleeve and driving head. Further to speed up operations we have designed and installed a hydraulically operated platform lo-

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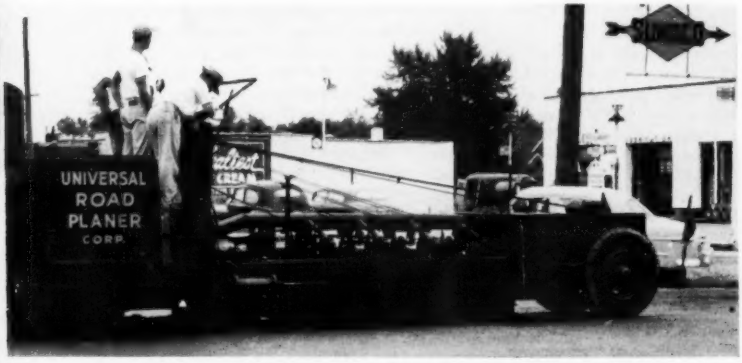


heats the pavement surface and peels off excess material.

● ***SIGN erection work is speeded by this special platform mounted on truck carrying compressor.***

● ***POSTS may be driven from the platform or from ground by using hand line for control.***

MACHINES AND MEN

M. W. FISHER,

Maintenance Engineer,

Wisconsin State Highway Commission

MECHANIZATION of many maintenance operations is bound within narrow limits by the very nature of the work. The clamor and glamor often associated with heavy road machinery at work would appear to have a small place in the life of a maintenance man who, day after day, is faced with breaking and crumpling pavements. Holes—some large, some small—need to be filled and refilled and usually with no greater amount of mechanization available than a long handled No. 8 shovel and a maintenance truck loaded with patching material. In Wisconsin, as in all states where deep frost action and attendant spring break-up is a matter of serious consideration, much more or less temporary patching of small breaks by hand methods, will be required for some time to come.

As indicated by comments and discussions of maintenance engineers at the recent meeting of the American Association of State Highway Officials, the need for mechanization is being felt keenly by maintenance engineers in every section of the country. The type of equipment sought depends to a large extent upon the particular maintenance problem considered most acute. In many cases the machine presently used for these special maintenance tasks is likely to be an adaptation of a piece of farm machinery. For example, in reply to one maintenance engineer's question regarding equipment available for mulching backslopes, another stated that he had attained considerable success with a silo filler remodeled to fit the job at hand. On the other hand, many machines on the market today would appear to be the answer to any maintenance man's prayer. Too frequently, however, the maintenance engineer is in about the same position as the small boy standing with his stubby nose pressed against the toy shop window. The marvelous tools and shiny machines inside the store window are beyond his grasp.

● ***CONCRETE breaker for major replacement work.***

Our System of Maintenance

Under the system of maintenance followed in Wisconsin, all of the maintenance equipment, except centerline markers and private contractors' equipment, used on the State Trunk Highway System, is owned and operated by the various county highway departments. Although a number of towns own trucks and motor-graders, yet the counties are the principal owners and operators of highway maintenance equipment. As provided by the Statutes, the State Highway Commission arranges to have all or part of the maintenance work performed by the counties under state direction and supervision. When maintenance is done by the counties under this plan,, the state reimburses them at pre-established uniform hourly rental rates for the equipment and hourly labor rates established by the county for their employees. It can readily be imagined that among the 71 counties there is a wide variety of machinery. However, in nearly all instances, trucks and motor-graders form the backbone of each fleet of equipment. Nearly 900 motor-graders and approximately 3,000 trucks are owned and operated by the county highway departments. Other equipment includes such items as: gravel and crushed stone plants; power shovels; tractors of all sizes; tractor mowers; bituminous mixing travel plants; hot-mix plants; distributors; "V" and blade snow plows; rotary snow removal units; travel-loaders, both belt and bucket types, as well as loader attachments for tractors and motor-graders; and many pieces of miscellaneous machinery.

● ***MILES of roadside mowing is done by pulled mowers and newer, tractor-mounted units.***

● ***LOADING equipment and attachments provide the greatest savings in time and labor.***

IN MAINTENANCE

Probably the many types of loading equipment and loader attachments, more than any other equipment, have provided the means of speeding up ordinary maintenance activities and reducing the amount of hand labor. This is especially true in ice control work. During recent winters between 150,000 and 200,000 cubic yards of abrasives (sand and cinders) are required, and when it is considered that the bulk of this is handled at least twice—once from the pit or producer's plant to the truck for stockpiling at strategic points, and then again from stockpile to truck preparatory to being spread on ice covered highways—it can be seen that in this single activity considerable labor can be saved by the availability of mechanical loading equipment. Nearly all counties own one or more of these loader attachments to supplement the one or two power shovels used for the heavier work. During the past two or three years, timber sand bins have been erected by the State Highway Commission at locations where a great deal of sanding is normally required. In addition to the actual saving in labor costs, there is immeasurable saving due to the celerity with which steep grades are made passable and traffic jams avoided. At one hilly location in Dane County, on U. S. Highway 12—a heavy truck route between Chicago and St. Paul-Minneapolis—in excess of 1,000 cubic yards of chloride treated sand were handled through one 130-cubic yard bin last winter. Maintenance engineers in the snow and ice areas are continually on the lookout for machines that will help to alleviate this strain and stress of winter maintenance problems.

● ***JACK hammers cut out small pavement sections.***

Mother Nature, ofttimes capricious in her habits, has been particularly bountiful in endowing Wisconsin not only with thousands of beautiful lakes but also with large glacial deposits of gravel and sand. The self-same glaciers that scooped out great dents in the landscape, likewise ground and pulverized it. During the process of transportation, this action continued so that when the ice masses, streams and winds were through toying with it, there were left numerous deposits of natural road-building material. These widespread deposits of relatively low cost materials have helped Wisconsin to attain an enviable position among the several states in total mileage of all highways surfaced. That, combined with an increasing demand for dust alleviation, has led to the "black-topping" of many miles of local town and country roads. More than fifty per cent of the 10,900 miles of State Trunk Highway is classed as road-mix surfacing, and on county and town roads there are approximately 14,000 miles. The total amount of this type of surfacing on Wisconsin's highways is, therefore, approximately 20,000 miles. The largest increase in this surface type has been on the county and town roads. During the past six years, the mileage has increased almost one hundred per cent.

Spring Maintenance

The repair and restoration of this large mileage of road-mix bituminous surfacing, following the usual spring break-up, calls for the use of machinery that will break up and pulverize damaged sections of the bituminous surfacing. To date motor-graders with scarifiers have been the most commonly used for this purpose. However, during the last two or three years a considerable number of tractor-drawn and self-propelled mechanical bituminous pulverizers have been put into use. During the past summer season, one county used a small portable crusher-pulverizer unit in conjunction with a mechanical belt loader. This combination turned out satisfactory work, but the original cost of the equipment discourages its

(*Continued on page* 110)

● ***PRE-MIXED bituminous patching material is handled by a loader attached to a grader.***

● ***TREE removal is mechanized by use of portable power driven chain saws.***

J. A. SALVATO, JR.
Chief, Bureau of General Sanitation
Erie Co. Health Dept., Buffalo, N. Y.

SUBDIVISION SANITATION IN RURAL AREAS

AS the growth of cities has been leveling off, the population of suburban and rural areas has been increasing, resulting in construction of many new homes. In recent years half of the new homes built are reported to use private individual sewage disposal systems.[1] Many people have the urge to "own a home in the country." Land is thought to be cheap, for the cost of constructing a private well and sewage disposal system is at first overlooked. In some instances, this construction has created sanitary problems. The U. S. Public Health Service reports[1] that "Four-fifths of the outbreaks of water-borne disease occur in communities of 10,000 or less, containing only about half of the population." As the more desirable property adjacent to sewer and water service is built on, and it is necessary to utilize more distant areas for developments, this problem can be expected to increase. Until a sufficient number of homes are built and central sanitary facilities are economically feasible, or unless the project is in some way "subsidized," substitute facilities which will prevent health hazards must be provided.

Where a community or public water supply exists, the problems of sewage disposal and drainage must still be solved. It would be ideal if both community water and sewer systems could be installed, but this is not always possible. In fact, it is frequently the case that no adequate means are available for providing these facilities satisfactorily. Such difficulty may arise from any one, or a combination of several reasons. The terrain may be unfavorable; or the soil poorly drained, tight or rocky, precluding satisfactory and economical use of septic tank systems and increasing the cost of sewer, water line or drainage construction. The rate of building construction may be so slow that immediate construction of water and sewerage facilities cannot be financed. Poor planning, with lots of inadequate size and poorly laid out, may make use of individual wells and disposal installations dangerous. Debt limitation may prevent construction by the municipality of wa-

Courtesy National Clay Pipe Mfrs. Inc.

● ***EXTENSIVE development of subdivisions in formerly rural areas has greatlyy increased the need for new sewer lines.***

ter supply and waste disposal plants unless a direct assessment, for the difference between the actual cost and permissible debt, is approved by the property owners, or other acceptable financing is devised. In the past, construction of unused streets, sewers and water mains on uncontrolled subdivisions has shouldered some municipalities with debt due to unpaid assessments, and also with the expense and responsibility of providing and maintaining police, fire, water, sewer, garbage and street services to scattered residences. Also, the builder or developer may be so limited in the funds at his disposal that no major construction is possible, at least until most of the development has been sold and built upon.

On the other hand, there appears to be no way for a health department to prevent an individual from purchasing a lot of an existing or potentially unlawful subdivision and building a house on it. If brought to the attention of the health department in time, restraint can be used by calling attention to local building regulations and ordinances, sanitary problems to be faced, FHA and VA restrictions and subdivision laws, if they exist. However, any attempt to prevent forcibly an individual from building and occupying his own house on a tract of land would be on tenuous grounds and would understandably meet with fundamental constitutional opposition. As a result, it frequently becomes necessary for the health department to require individual solutions to sanitary problems for which, in some instances, there are no known simple and inexpensive answers. This places both the owner and the health department in a difficult position.

Existing Legislation

Because lots in developments have been sold which are too small to accommodate satisfactorily both a private well and a septic tank system, or in which the soil is wholly unsuitable for individual waste disposal methods, legislation has been adopted in some areas which have given reasonably good results. Hall[2] made a comprehensive survey of laws and practices in effect in many of the states.

New York State, Public Health Law, Chapter V, Section 89, provides that before land platted for a subdivision, upon which dwellings for ten or more families may be constructed, is put on the market and before any permanent building is erected thereon, a plat of the area showing the methods proposed for water supply and sewage disposal must be approved by the commissioner of health. Filing or recording by the county clerk or register of any subdivision map or plat is prohibited without health department endorsement.

Westchester County, N. Y., Sanitary Code, Article IX, Realty Subdivisions, requires essentially the same procedure but also includes tracts of fewer than ten lots. Furthermore, when water is to be provided by individual wells, and separate sewerage systems are to be installed, each building site must have a usable area of at least 20,000 sq. ft., and more may be required. Where water is available from a public supply, but individual sewage disposal is to be used, building site areas must be at least 7,500 sq. ft. Allowance is made for sale of building sites with the understanding that public water and sewerage facilities will be provided, the sale contract carrying a requirement that these be installed to serve buildings constructed on the development. When building sites are sold without provision for public water and sewer services, the seller is required to furnish each lot purchaser with a copy of the approved plan showing the arrangements for water supply and sewage disposal to be complied with. Health department approval is required before submission of the plan to the planning or other boards having jurisdiction. Provision is made in the law for filing a "notice of violation" in the county clerk's office, in addition to other penalty, for failure to comply with the Sanitary Code.

The Town of Carmel, Putnam Co., N. Y., and the Town of Orchard Park, Erie Co., N. Y., have ordinances supplementing state and county subdivision laws relating to the provision of water and sewerage for individual building sites. Orchard Park also prohibits occupancy of a dwelling until the county health department issues a certificate of compliance. The design of disposal systems and construction of wells, where required, is based upon county health department investigation, soil tests and recommendations, before construction is started.

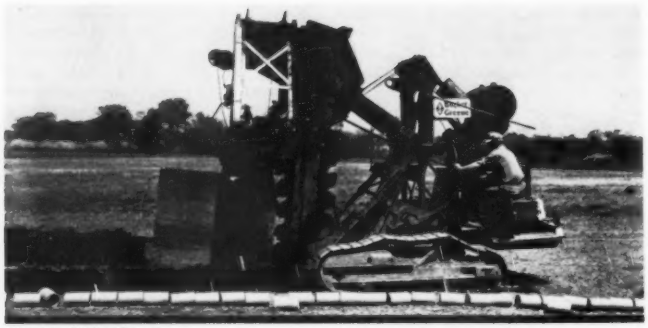
Planning and Engineering

The state and county legislation summarized above require the employment of a licensed professional engineer or land surveyor to prepare the subdivision plans for approval. Consulting engineers are sometimes reluctant to take a subdivision job which involves the design of individual or small central water supply and sewerage systems. This reluctance may be due to unfamiliarity with the regulations and type of plans to be submitted, or because the time and effort to work out satisfactory plans appear to be too great for the fee that can be charged.

On the other hand, engineers can perform a real public service by wise advice and sound design. Public water supply and waste disposal are recognized by all to be desirable, and far better investments, where practicable, than are individual systems. There are situations however where this may have to be justified for reasons other than economy.[3] Every possible means of providing one or both of these centralized sanitary facilities should be investigated;

Courtesy Cleveland Trencher Co.

● ***TRENCHING machines help speed the installation of new sanitary facilities to keep up with house construction.***



Courtesy Barber-Greene

● **MANY builders have used marginal land needing drainage.**

and, if necessary, these may involve step-by-step programs which will lead to eventual provision of these facilities. This will be difficult where only a few houses are built each year, and these on widely separated locations. On the other hand, controlled development may be worked out which can make possible the step-by-step construction or extension of water and sewerage. This has been done with benefit to the developer, the engineer, the purchasers and the municipality or public.[4, 5, 6]

Subdivision Control

Controlling subdivision of property, building of homes and sale of lots in the first place is the most logical starting point to prevent insanitary conditions. Such a procedure, however, must be supplemented by a firm administrative policy supported by a sound law and an aggressive legal department. If this is not done, the program will cause many inequities, will complicate and delay the provision of sanitary facilities, and will be damaging to the prestige of the enforcing agency. Controls which have been used and found effective are summarized below.

1). A state or county law, supplemented by city, village and town law requiring the submission of a subdivision plan for approval by the state or county health department showing satisfactory arrangements for water supply, sewage disposal and drainage before any lots are sold or building construction is started. When lots only are sold, without a central water supply and sewerage system, the developer should be required to include a statement in the deed or contract of sale that arrangements for water supply and sewage disposal shall be installed in accordance with plans approved by the health department. Examples of such laws have been summarized above.

2). Adoption of a planning law including subdivision control, preventing the county, city, village and town planning boards, zoning boards, and clerks to accept subdivision plans or maps of roads which do not bear the stamp of approval of the health department, as provided for by law. Enforcement of laws requiring filing of plans of tracts before lots are sold.

3). Refusal of the water department or water company to provide water to subdivisions which do not have health department approval, so as not to be a party to a possible nuisance and cause for property devaluation.

4). Refusal of the city, town or village clerk, or other agent, to issue a permit to build on subdivisions which have not been approved by the health department, as provided for in the building code, or other local ordinance, or as requested by the health department in the absence of a local law.

5.) Refusal of loans by financial institutions to build dwellings on subdivisions which have not been approved by the health department, and refusal of the FHA, VA, bank or other lending institution to make final payment where the installed sanitary facilities have not been inspected and approved by the health department.

6). Refusal of a certificate of occupancy required by the local building code or other law where the installed sanitary facilities have not been inspected and approved by the health department.

7). Education of local officials, real estate developers, builders, lending institutions, and the public of the health, nuisance and property devaluation dangers of unapproved subdivisions, and of the advantages of a healthful environment.

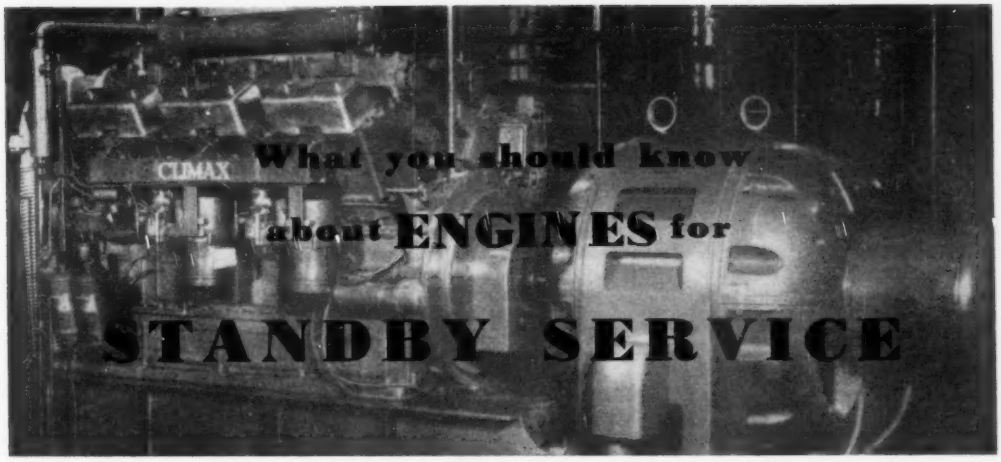
8). Requirement by city, village and town law that the developer install, or post a performance bond sufficient to cover the cost of installing approved water mains, sanitary sewers and storm sewers before permission to build is granted, where this is reasonably possible. If the municipality furnishes these utilities, this section would not apply.

9). Declaration by the health department that a property is unsatis-

(*Continued on page* 80)

Courtesy National Clay Pipe Mfrs. Inc.

● **FOR speed in installation, pipe sections may be pre-joined.**



E. D. WEST,
Director of Sales,
Climax Engine & Pump Mfg. Co.

STANDBY or emergency power is a form of insurance for the protection of life and property, and at times a means of avoiding financial losses resulting from enforced shutdowns due to failure of normal power supply. A further point is that fire insurance rates in villages, towns and cities are affected by the municipality's classification by the Underwriters. The classification is determined by the fire fighting facilities maintained by the municipality. Standby power and/or pumping equipment frequently improves the classification and results in a reduction in insurance rates.

Engineers responsible for the design of public works projects are giving standby equipment more consideration than in former years, regardless of the fact that public utilities have materially improved their facilities and are providing more dependable service. These engineers recognize the possibility of power interruptions due to mechanical failure of equipment, storms, floods and sleet. In addition, our enlightened civilization has introduced the hazard of enemy bombs.

Specifications for a standby power unit should be written with the same care exercised with specifications for units required for continuous duty service. The fact that "it is just for standby" is no excuse for accepting whatever the seller may wish to furnish. The fact that the engine is for standby or emergency use justifies every precaution being taken to secure an engine that operates at moderate speed, is designed and equipped to assure quick starting, and has sufficient surplus capacity to make it a dependable source of power for whatever period the emergency may exist. A standby engine that is not properly designed and applied is worse than none, as under such circumstances dependence is placed on a protection that does not exist. However, compared with engines for continuous duty service, higher piston speeds and higher BMEP's can be justified due to the fewer hours of service over a period of years. A standby unit should not be installed and forgotten. It must be maintained in good condition and operated frequently for short periods to keep it well lubricated and ready for emergency use. Where power requirements do not exceed approximately 600 hp in single units, a gasoline or natural gas engine is the most practical selection from a standpoint of first cost, flexibility, dependability, quick starting and maintenance.

The Fuel System

The gasoline fuel system must be designed to conform to local fire protection requirements. It will consist of carburetors on the engine with spark arrestor type air cleaners: engine driven fuel pumps; and a displacement type, hand operated pump for priming. A small gravity fuel tank mounted on the engine or on the wall will assure a fuel supply to the carburetors at all times for quick starting. The main supply tank should have an Underwriter label and must be located outside the building, and preferably buried in the ground. The bottom of the tank should be not more than eight feet below the engine and the horizontal fuel line should be as short as possible. Both suction and overflow lines should slope toward the tank. If local conditions require that the supply tank be installed at a point higher than the engine it will be necessary to install an Underwriter approved anti-syphon valve in the suction line. As gasoline deteriorates if stored indefinitely, the size of the fuel tank should not be larger than necessary to supply the engine for reasonable periods. The size can be selected based on fuel consumption estimated at the rate of approximately one-tenth of a gallon of gasoline per horsepower hour.

Methods of Starting

Any of the following methods of starting the engine may be employed: 1. Low voltage storage battery with push button control; 2. Low voltage storage battery with automatic control; 3. Small hand cranked gasoline engine; or 4. Compressed air.

The most popular method is by means of a low voltage storage battery; a starting motor or motors mounted on the engine with Bendix drive to flywheel ring gear; a generator which will charge the battery during operating periods; and a push button on the instrument panel or at some remote location. With this system the battery is all

important. It must be of ample size and must be kept in a charged condition at all times. As the engine normally does not operate enough hours to keep the battery charged, a battery charger or rectifier connected to the power supply must be included. A "trickle charger" is not satisfactory as the current discharged during cranking periods must be replaced. The charger should have a charging rate of not less than 6 amperes with taper characteristics. To avoid operator failure to check the battery frequently, the charger can be of the automatic type.

Starting and Ignition

Automatic starting can be accomplished by a control, consisting of relays in a metal cabinet for location near the engine, which will start the engine whenever a pilot circuit is closed by means of a power failure relay, a contact on a generator transfer switch, or a pressure switch. The control system provides protection against overcranking, oil pressure failure, excess jacket water temperature or overspeed, with an alarm and signal lights to indicate the cause for any emergency shutdown. Time delays can be included which will delay the engine start for any desired time after failure of normal power supply; delay automatic shutdown for any desired time after normal power supply is restored; or permit the engine to continue in operation until manually shut down.

For isolated locations, or if for any reason a storage battery cannot properly be maintained, the engine can be equipped with a small gasoline driven, hand-cranked, engine mounted in place of the low voltage starting motors.

If compressed air is available in sufficient quantity and under enough pressure, it makes a very satisfactory starting medium. The quantity and pressure will be governed by the engine size. If not a part of the station equipment, it will be necessary to provide a two-stage motor or gasoline engine driven compressor with an air receiver of sufficient capacity to provide for a number of starts. If several engines are installed in the same building the extra cost of the compressor and storage tank is frequently justified.

As engines of the class under discussion are of the spark ignition type two ignition systems should be included, each firing a set of plugs. One system can consist of one or more distributors and coils with current supplied from the storage battery, with the other system consisting of one or more magnetos. The engine should be capable of developing the power required with either or both ignition systems in operation.

The engine should be protected from overheating or overcooling. The jacket water outlet should be not less than 160° F or more than 190° F. Cooling water entering engine jackets should not be less than 140° F or more than 170° F. Provision should also be made to bring the engine up to normal temperature as quickly as possible to enable it to take on the load without stalling or speed loss. Operating temperatures as indicated are necessary for best lubrication, minimum wear, maximum power output and overall efficiency. Small differential between inlet and outlet temperatures of cooling water avoids danger of unequal expansion and casting strains.

Cooling Water

For municipal water works or other locations where there is an ample supply of non-scale forming water for cooling purposes a very satisfactory temperature control system consists of a high capacity engine driven circulating pump with a by-pass from the water outlet manifold to the pump suction and a thermostatic control valve on the cold water line with its thermal bulb installed in the water outlet manifold. The rapid circulation produces a scrubbing action and eliminates danger of air or steam pockets. The by-pass tempers the cooling water before it enters the engine jackets and the thermostatic valve governs the amount of water based on actual horsepower being developed and the temperature of the cooling water. Such a direct cooling system will require approx mately one-tenth gpm of 70° water per hp.

If the local water supply is hard and scale forming, a heat exchanger should be used with soft water in the jacket water system and a make-up or surge tank to take care of expansion and provide a vent for air or steam. The thermostatic valve should be located on the raw water inlet to the heat exchanger. The amount of water required will depend upon the size and type of the heat exchanger selected. If a sufficient and satisfactory supply of cooling water is not locally available the engine can be cooled by means of a radiator with thermostatic by-pass and fan driven by the engine. Where a radiator is employed the room must be exceptionally well ventilated or provision made to expel the cooling air thru a duct system to the outside, otherwise there is a tendency for the air to recirculate and build up temperatures that interfere with proper cooling. The fan load alone will amount to at least 5% of the engine capacity and must be deducted in arriving at the net engine output. A cooling tower, evaporative cooler, or other cooling methods may be dictated by local conditions.

Power for Water Works

Hundreds of municipal water works throughout the country have standby gasoline engine power. Engines can be direct connected to individual pumps, or through disconnect, free wheeling or automatic clutch couplings to electric motor driven pumps, where the motor is used for normal operation and the engine for emergency. When it is not feasible to direct-connect engines to pumps, engine-driven generators are frequently installed to furnish the power to operate such pumps as may be needed during emergencies. The size and characteristics of the generator required can be determined by instruments if the standby unit is to be installed in an existing plant. If it is to operate motors not already in service the generator characteristics must be arrived at by calculation. The first step is to determine the maximum demand in kilowatts; 85% of the total horsepower rating of all motors that may be in service at any one time will indicate approximately the kilowatts needed for power. To this add the kilowatts required for lighting. The horsepower required to drive the generator will be the KW required divided by 0.746 times the per cent of generator efficiency. To provide proper reserve capacity, approximately 25% should be added to arrive at maximum engine rating.

Illustrative Example

Total motor load

300 hp. x 0.85 =	255 KW
Lighting Load =	20 KW
Required generator rating	275 KW

Required hp input: $275 \div 0.74 \times 0.93 = 396$ hp. And allowing a 25% margin of reserve capacity, the engine rating should be about 500 hp.

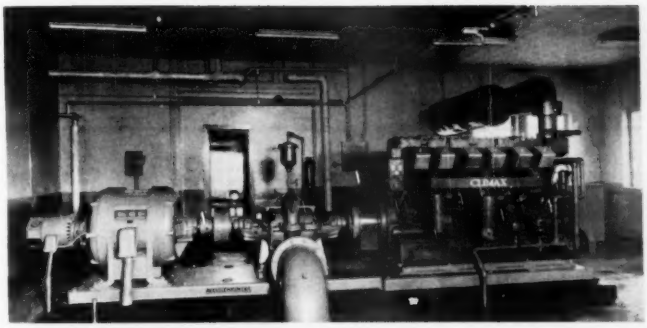
After arriving at the correct KW capacity of the generator and the horsepower capacity of the engine, it is necessary to check the kilovolt ampere (KVA) capacity needed to take care of the current requirements during motor starting periods. If the current demand during starting periods causes the voltage to dip more than 25% from normal, motors on the line with under voltage protection will drop out. A squirrel cage induction motor with an across-the-line full voltage starter will require 5 to 6 times the running current during the starting period. Compensator type starters with low voltage taps will reduce the starting current requirement approximately 50% and wound rotor type motors with resistance starters present no serious problem. A generator with a special KVA rating is frequently required. This rating can be established if all the motors are listed by size (hp.), type, speed, type of starter, and desired starting sequence. While this may call for a larger generator, or a generator with special windings, the engine horsepower will not be affected as the excess current produced during the short starting periods is at a low power factor and is not reflected in excess kilowatts.

Flood Control

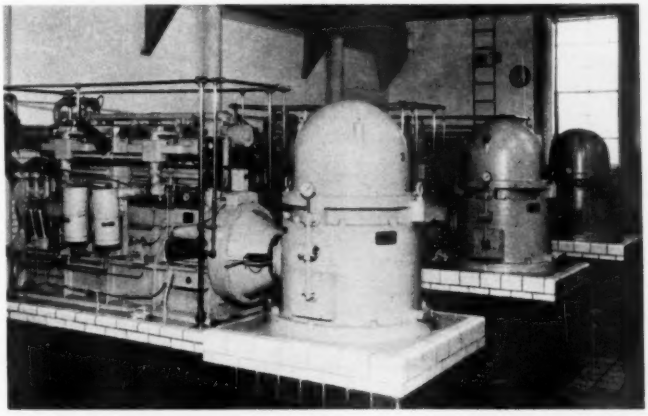
Another important use for gasoline engine emergency units is in connection with flood control. For this purpose large capacity low head pumps are used. As they are in service during flood conditions only it is usually less expensive to utilize gasoline engines and avoid the heavy standby charge where electric motors would otherwise be used. There is the further advantage of knowing that the engines are always ready for service no matter what weather conditions are.

The Division Engineer, Corps of Engineers, at Boston, Mass., has installed a large number of flood control pumping stations for municipalities in New England. The pumps are powered by gasoline engines ranging in size from 100 to 300 hp. There are two to four pumps per station. A number of sewage treatment plants have installed gasoline engine driven pumps to take care of flood water. The City of Saginaw, Michigan is completing a comprehensive flood control project in accordance with plans and specifications by Hubbel, Roth & Clark,

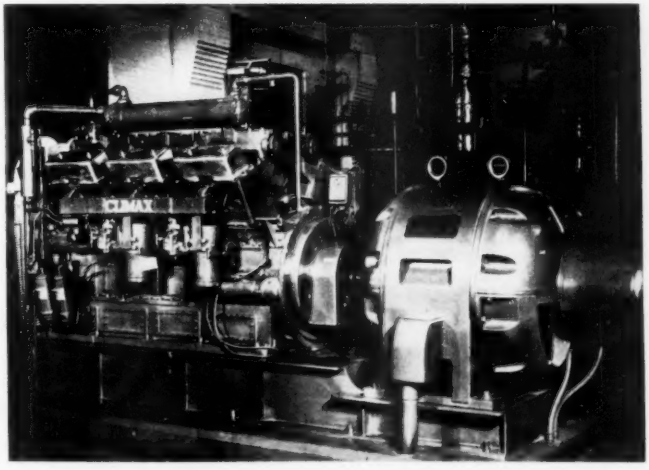
(*Continued on page* 112)



● ***5,500 GPM high service pump has dual gasoline-electric drive. If electric power fails, the engine takes over.***



● ***FLOOD control pumping station has gasoline engine drive on pumps. Since use is infrequent, electric power is not provided.***



● ***STANDBY gasoline engine driven generator at a pumping station.***

REPORTS from the FIELD
Better Methods and Equipment

A SCOOPMOBILE is used to handle and place concrete cribbing. We pile our cribbing with 2-inch by 2-inch pieces between the layers. This enables our Scoopmobile operator to pick up the pieces of cribbing with no additional manpower, and eliminates the need for two laborers. The machine carries the cribbing to the wall and places it practically in final position.—Fred Long, Maintenance Sup't., State Roads Com., Parsons, W. Va.

WE DESIGNED a special gun to force concrete grout around a 24-inch pipe which we put inside of a 30-inch pipe under the dam at the source of our water supply. We received bids for placing this grout between the pipes, but saved about $1,500 by designing and using this special equipment. We think it is quite unique and it worked perfectly. Also, we constructed a 60 by 120-ft. swimming pool by force account, using the following city equipment: Power shovel, D7 Caterpillar tractor and dozer; and a large concrete mixer, trucks and other necessary tools. E. H. Ford, City Manager, La Grande, Oregon.

● *ONE-TOOTH ripper is attached to a crawler tractor bull-dozer, "the best all-purpose machine we use," by George H. Vossbrink, Highway Engineer of Union County Missouri.*

BEST ALL-PURPOSE machine is the bulldozer. I have designed a one-tooth ripper that can be attached to the yoke by dropping the blade; it is very useful in hardpan or shale rock, and can be used in ditches or other close places.—George H. Vossbrink, Highway Engineer, Union, Mo.

WE USED PIPE pushers very effectively to push a 16-in. cast iron pipe 60 ft. under a railroad. We made the push uphill, using two Greenlee Model 790 pushers assisted by jetting from a 2-inch line with a shop built nozzle under 50 lbs. pressure.—T. B. Noland, City Manager, Ashland., Va.

ELEVATIONS VARY from 5100 to 8000 ft. in Natrona Co. We are endeavoring to build roads with practical-haul grades and snow-free for year-round travel. We try to get more elevated roads and have changed our method of construction from the motor or elevating grader to the tractor and carryall. The advent of irrigation projects and the hundreds of earthfill dams for stock water has effected enough control of stream flow to permit replacement of old timber bridges with culverts and earth fills—another place where we use the tractor and carryall. At one site we replaced an old 4-span untreated timber bridge with two 48-inch by 90-ft. corrugated culverts and made an earth fill for a 24-ft. roadway.—Albert M. Zuill, County Surveyor, Casper, Wyo.

A SLOPING BLADE has been installed on our motor patrol to pull in the dirt and finish the shoulder slopes after the oil mat is laid. Last winter, when the snow was packed so hard that no 4-wheel drive plow could operate, we opened all of the bad places with our Tournadozer.—M. G. Johnson, County Engineer, Barron Co., Wisc.

TO DIVERT STREAM flow during repair work, we used baled hay on a cable. We have also used baled hay successfully for ditch checks.—Z. N. Dewey, County Engineer, Knox Co., Nebr.

● *CRAWLER tractor equipped with a crane speeds handling of 8-inch water pipe into the trench at El Cerrito, California. Tractor is International; crane is Superior.*

NOT BEING SATISFIED with the speed of cleaning up the streets after a snow storm, our Road Foreman built a bucket holding about 3 yds. This hooks on to the snow plow hitch on a truck. The snow is windrowed, scooped up, moved to our unloading zone (a short haul) at the river and dumped. The actual saving in time in cleaning is about 3 hours.—C. E. Robinson, Town Manager, Fairfield, Maine.

WHILE WE HAD no outstanding jobs last year, we did build quite a lot of water, sewer and electric extension. Among the equipment we used were: A Barber-Greene ditcher; Minneapolis-Moline tractor with Lull loader and dozer; and a Master generator with Cummins diesel power unit.—R. A. Toler, City Manager, Giddings, Texas.

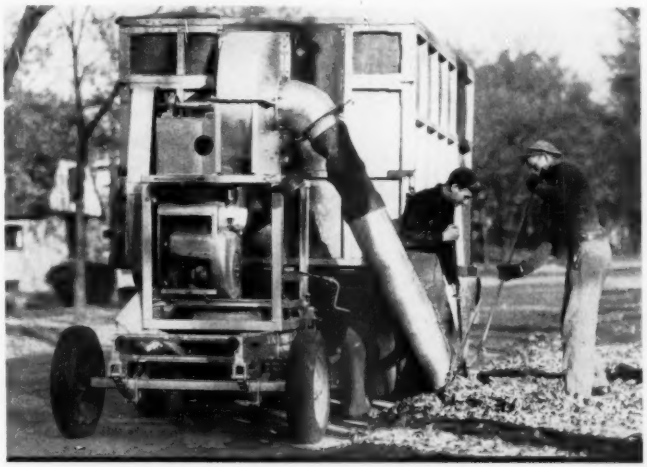
WE HAVE AN aerial ladder that has just about solved our tree trimming problems. We purchased an Army half-track on which was mounted a 40-ft. aerial extension ladder operated by compressed air furnished by a compressor also mounted on the half-track. Tree trimming has been one of the major problems of our utility for many years, and since, with this equipment, we were able to do a better job in very much less time we are very pleased with it. We estimate that the saving in labor will pay for this machine in two years and that, meanwhile, we will have trees trimmed away from our utility lines better than ever before.—Vern Livingston, Manager, Nebraska City, Nebr.

A REVOLVING BOOM was installed just ahead of a winch on a $2\frac{1}{2}$-ton truck with a semi-trailer. This proved very useful in loading, unloading and laying or distributing cast iron pipe in our water system extensions. The winch line, working through pulleys furnished the power and the revolving boom permitted handling the pipe wherever desired.—J. S. Williams, Director of Public Works, Bay City, Texas.

EXCESSIVE RAINS and many washouts kept our truck-mounted Bantam shovel busy all summer. We found that this machine is fast, and easy and cheap to move from one job to another.—M. E. Hickethier, County Engineer, Floyd Co., Iowa.

IN THE PROCESS of equipping our maintenance shop last year, we installed an electric welder, a traveling crane and several new types of hoists and jacks.—Henry R. Bray, County Highway Engineer, Nobles Co., Minn.

A PORTABLE CRUSHER and a Unit dragline have been used to make many tons of fine road material out of rock and gravel that would otherwise have been wasted. —G. F. Holman, Supervisor, Versailles, Ind.



● ***LEAF sucker-upper, mounted on a truck, has been built by the Village of Shorewood, Wisc. It worked so well, another was built.***

WHETHER OR NOT we can afford them, as Highway Engineer, I am interested in a hoist attachment for our Caterpillar D6 tractor; a light gravel loader to pick up windrows of oversize gravel along road edges; and a tractor winch for attachment to Caterpillar D6 tractors. —Dr. Clair V. Mann, County Surveyor and County Engineer of Highways, Rolla, Mo.

WE HAVE DEVELOPED a buck rake for our front-end loader to gather brush and stumps when clearing for new roads. We found a rented chain saw was a great labor-saver; and we use a mechanical compactor for bituminous patches and an air vibrator for compacting fills.—P. M. Pashby, Superintendent, St. Joseph Co., Mo.

LAST SPRING OUR winter seemed nearly over, but then came a 5-day blizzard on March 17 which blocked our entire county road system. By operating our rotary Sno-Go continuously for ten days and nights, we were able to clear a large mileage completely and save that many miles of gravel surface from being destroyed.—E. G. Chilton, County Highway Engineer, Detroit Lakes, Minn.

A WELDING TRUCK, which is complete in itself, has been developed by us. We can place steel on bridges, weld and burn pipe and do many other miscellaneous jobs. It is a complete shop which can be moved onto the jobs wherever required. We have also installed a spray booth to paint all of our equipment a highway yellow. While bridge painting on larger structures is let out by contract, we do smaller jobs with our own equipment. We purchased a great deal of equipment this year.—Carl H. Bauer, County Engineer, Dayton, Ohio.

WE USED OUR Pettibone-Mulliken loader for shoulder work, grading embankments, widening roads, excavations for curbs and gutters, etc. I am interested in a conveyor-belt type street cleaning machine that will remove excess chips, debris and accumulated dirt from roads and streets at a rate of 10 miles a day.—J. Fred Offutt, Roads Engineer, Towson 4, Md.

WE MAY PURCHASE, during the coming year, equipment for operating a sanitary fill; and some ditching equipment also may become necessary. — C. M. Moyer, Jr., County Engineer, Covington, Va.

BENTON'S DUAL-FUELS PAY OFF

W. H. GOTTLIEB

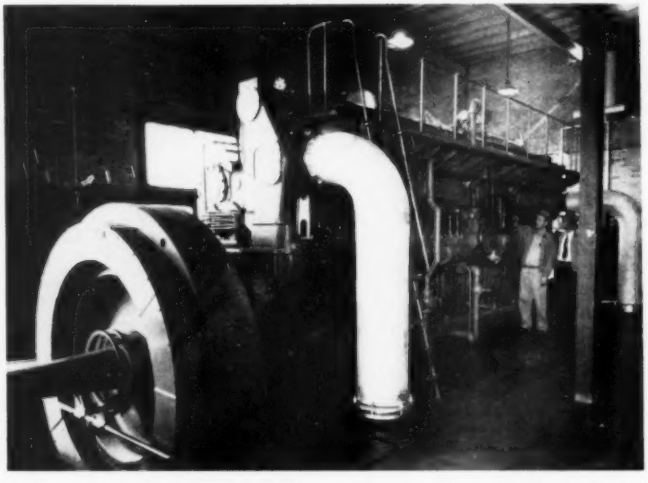
In only three months, the Benton, Ark., municipal power plant switched completely from oil-burning diesels to dual-fuel engines using cheap natural gas with a small quantity of pilot oil. In April, 1950, this Arkansas city put into service a new 2,000-hp Fairbanks-Morse dual-fuel engine. In May, it converted to dual-fuel operation a 1,400-hp F-M diesel which had been in service since 1945. In June, it converted to dual-fuel operation an 810-hp F-M diesel which had been installed originally in 1940. The result is an annual saving of more than $33,000. Benton still has diesels in its plant but they serve as standbys while the gas-burning units carry the entire load.

In order to appraise the accomplishments of the dual-fuel engines, we have selected a 12-month period ending October 31, 1950, a period which includes five months in which the diesels bore the whole load, two months with both oil and gas engines in service, and five months in which the dual-fuel units carried virtually the entire load. During the year, the diesels produced 3,753,940 kwh while consuming 318,728 gal. of fuel at a total cost of $28,185.78. This is an average fuel cost of 7.5 mills per kw hr.

The dual-fuel engines generated 4,334,180 kwh on a fuel consumption of 53,457,000 cu. ft. of gas costing $10,383.25 and 45,354 gal. of pilot fuel costing $4.213.51, a total fuel cost of $14,596.76. The cost per kwh was 2.39 mills for gas and 0.97 mills for pilot oil, a total of 3.36 mills. Here is the way the savings per kwh shape up:

Diesels	**7.50 mills**
Dual-fuel	**3.36 mills**
Saving	**4.14 mills**

For the seven months the gas-burning engines were in service, the saving on fuel amounted to $17,943.50. For a full year, with production volume equal to that of 1950, the saving of 4.14 mills per kwh will total $33,484.82. Actually, savings will be somewhat higher because the price of fuel oil rose during 1950 and the dual-fuel advantage rises with the price of oil. Wyatt B. Crawford, superintendent of the electric light, water works and sewer districts, calculates annual savings of $36,000. He points out that this saving is sufficient to pay off in 20 years the interest and principal on revenue bonds which financed the purchase of the 2,000-hp. engine, conversion of the two diesels, construction of a $100,000 sewage disposal plant, and construction of a new $75,000 reservoir. In addition to all this, the city will net $13,000 a year.



In Benton's 6-engine, 5,590-hp power plant, three units totaling 4,210 hp are dual-fuel and three totaling 1,380 hp are diesel. The dual-fuel units are capable of operating as full, oil-burning diesels. In case of failure of the gas supply, these engines switch to oil instantaneously without droppign their load.

The plant uses the same fuel oil for pilot fuel as it used for its diesels. It is a 28-32 gravity diesel fuel delivered in tank car lots and stored in two 12,000-gal. steel tanks. From storage the oil goes by gravity through meters to individual day tanks (a 600-gal. tank for the 2,000-hp engine). Supply pumps on the engines draw oil from the day tanks through duplex filters. On the dual-fuel engines, separate small-volume injection pumps handle the fuel for operation on gas and pilot oil.

The natural gas, with a heating value of 1,000 btu per cu. ft., reaches the plant at 35 lbs. pressure and passes through meters and regulators before reaching the throttle valves on the engines. Automatic safety devices prevent admission of gas unless pilot oil is being delivered to initiate combustion.

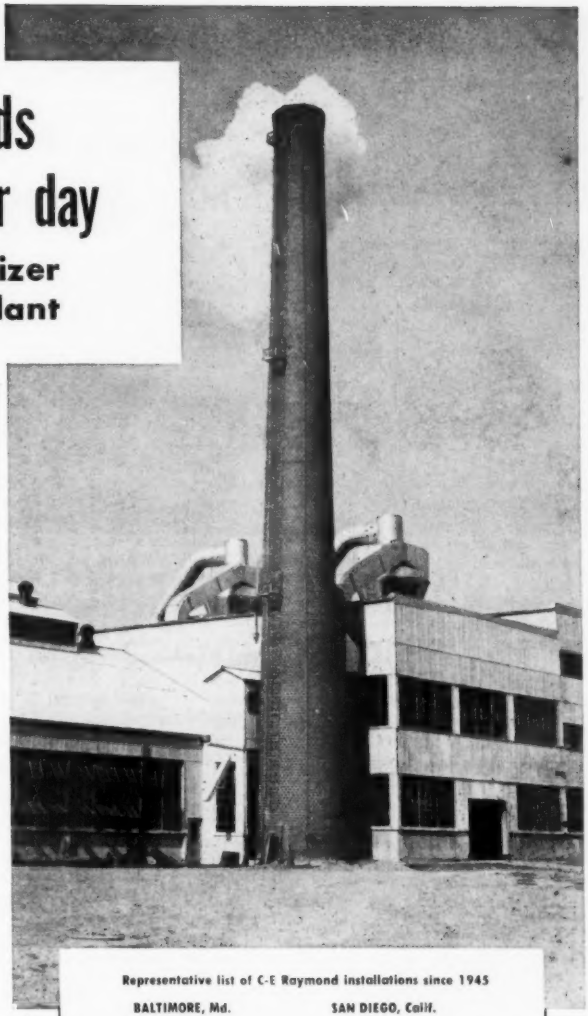
Benton has been growing at a phenomenal rate. Between the 1940 and 1950 census tabulations, population rose from 3,500 to 6,300 and much of this growth had been concentrated in the last few years. In 1947 the electric department has 1,776 customers and in 1950 there were 3,000. Consumption of electricity has been nicely balanced between industrial and residential consumers. Three furniture factories, four lumber mills and a pottery shop have collaborated with home appliances and air conditioning to raise morning peak loads to 2,100 kw.

But the plant has kept pace with demand. Supt. Crawford and Commissioners H. W. Finkbeiner, W. R. Kauffman and Fred Walton have seen to it that expansion of generating facilities came in time to anticipate load expansion. The city has an exchange agreement with Arkansas Power and Light and has sold some power to the utility but has never found it necessary to purchase any. In the last 20 years, there has been only one 12-minute interruption of service because of engine trouble.

The plant has been consistently profitable (net earnings topped $50,000 in each of the past two years) and cash contributions to the city have been so great that currently the city is tax-free.

750,000 pounds of filter cake per day

converted to fertilizer at new Houston Plant



Another step in Houston's long range plans for complete waste treatment was finished last August with the opening of a C-E Raymond equipped, 28,000 tons per year municipal sewage sludge drying plant.

The two new Flash Drying Units, located at Houston's North Side plant, dry activated-sludge from both the North Side and Sims Bayou plants. Most of the dried sludge is marketed locally for fertilizer but some is shipped as far as the East Coast.

This new plant, designed to serve an equivalent population of 775,000, is equipped with two C-E Raymond Flash Drying Units, each having an evaporation rate of 12,000 pounds per hour.

The Houston Plant is typical of C-E Raymond System installations, now in service in virtually all parts of the country, meeting the varying requirements of both large and small communities. They are flexible in layout, highly efficient and thoroughly reliable; they provide for maximum utilization of waste heat.

The services of C-E specialists are available to assist you in finding the best solution to *your* sludge disposal problem. Get in touch with the office nearest to you for prompt attention.

Industrial sludges a problem?

C-E Raymond Flash Drying and Incineration Systems have been the answer for others. Write for information.

Representative list of C-E Raymond installations since 1945

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HOUSTON, Texas
LOS ANGELES, Calif.
SAN DIEGO, Calif. (Extension)
SAN FRANCISCO, Calif.
SCHENECTADY, N. Y.
SHEBOYGAN, Wis.
WATERBURY, Conn.
COLNE VALLEY, England
RECIFE, Brazil
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COMBUSTION ENGINEERING—SUPERHEATER, INC.

FLASH DRYER DIVISION

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Western Office: 560 W. Sixth, Los Angeles 14, Calif. • Eastern Office: 200 Madison Ave., N. Y. 16, N. Y.

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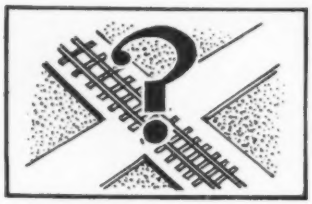


GRADE CROSSINGS RATED ON HAZARD TO TRAFFIC

MORE than 2,000 railroad grade crossings on North Carolina's secondary rural roads have been classified as to their potential danger to motor vehicle traffic following an intensive survey by the State Highway and Public Works Commission. The study was conducted by the Commission's Division of Statistics and Planning, headed by James S. Burch, in cooperation with the U. S. Bureau of Public Roads. It was prompted by North Carolina's rapidly expanding rural road program and was designed to show which grade crossings have the highest relative accident potential. The study will be of great help in planning roads and adequate safeguards for traffic at those crossings where the chances for accidents are greatest.

In North Carolina, 33 operating railroad systems cross 2,024 rural county roads at grade. This number of crossings does not include delimited suburban areas or some minor spur-track crossings. Each of these crossings was studied on the spot, and each was given an index rating based generally on the physical characteristics of the crossing (such as sight distance), the number of vehicles using the crossing, and the number, time and speed of trains moving over the crossing each day. The higher the index rating, the greater is the indicated potential danger. The hazard index rating ran at high as 8,962, which was the rating given a crossing in Wake County at Method, near Raleigh. However, of the 2,024 crossings, only four have hazard indices over 5,000. Two of these are in Wake County, one in Gaston and one in Mecklenburg. Each of these crossings has highway warning signs and other signals.

In the 1,000-5,000 hazard index bracket, there are 77 crossings distributed in 32 counties, with Wake and Mecklenburg counties having seven each, Vance six, and Halifax five. Of these 77 crossings, 14 are protected with electric flashing signals, while the remaining 63 have only highway warning signs.

In addition to making an on-the spot study of each crossing, the men conducting the survey examined the files of the Department of Motor Vehicles for data on accidents at grade crossings from January 1, 1946 to January 1, 1951. The railroads also cooperated. Each crossing was examined and measured for sight distance, angle, grade and other physical characteristics. The volume of vehicular traffic and other pertinent factors were taken into account. Mr. Burch said, "It is believed that this report will be of real value in selecting, in the most logical manner, the crossings which require protection; and in designing to avoid the maximum number of accidents at a minimum of cost."

Grade crossings on primary highways were not included in the study, since such a survey had been made previously.

Since early 1949 the state has hard-surfaced over 8,000 miles of secondary roads, and another 4,000 miles of new paving is planned under the present bond program. Highway officials realized that grade crossings on such roads would assume a higher accident potential due to increased traffic, increased speed and more drivers unfamiliar with the roads.

"It is a known fact that traffic increases on such newly-paved roads from 20 per cent to 40 per cent, and sometimes even as high as 100 per cent or more, due partly to traffic transfer from other local roads," Mr. Burch stated in his report. "The increase in traffic, in itself, would not be too serious a matter were it not accompanied by an increase in vehicular speed and in the percentage of non-local drivers."

Pointing out that a rather high percentage of the rural railroad grade crossings will be involved in the secondary road program, Mr. Burch continued: "It becomes apparent, then, that unless steps are taken to provide adequate protection for these crossings, the state may expect an increased rate of accidents at grade crossings, with attendant injuries, extensive property damage, and loss of human lives. Realizing the seriousness of this situation, the Division of Statistics and Planning has undertaken the task of evaluating all these crossings on the basis of their relative traffic hazard."

The report includes basic data for each of the 2,024 crossings and individual county maps which show the locations of the 400 crossings with the highest hazard rating. Copies have been distributed to State and Federal highway officials and to the 33 railroads operating in the State.

• • •

Chopper Speeds Up Brush Disposal

A heavy-duty brush cutter with a brush chopper has been used to facilitate brush removal in District 1 of the California Highway Department, according to A. A. Miller, District Maintenance Engineer, reporting in California Highways and Public Works.

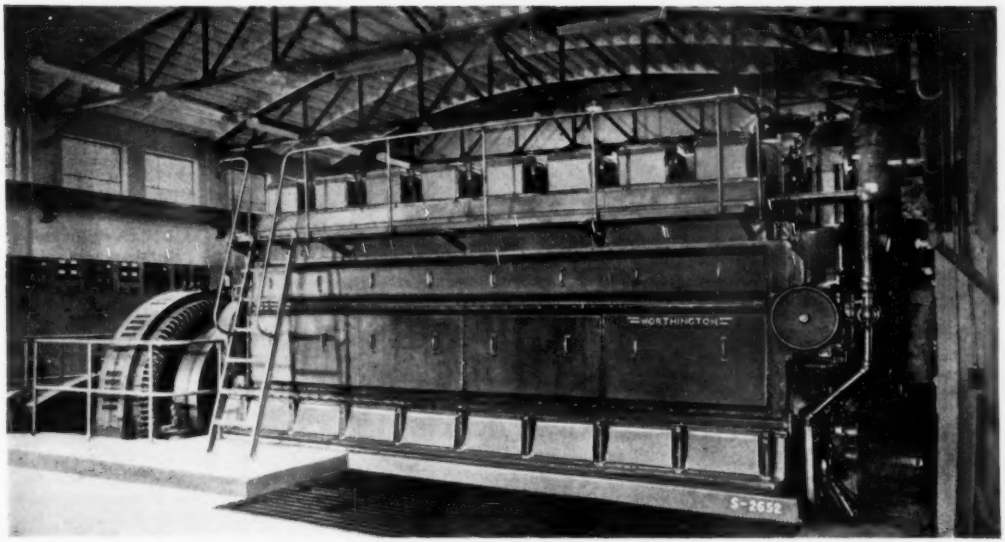
The brush chopper, which consists of a special planer head revolving at about 4,000 rpm, is powered with a 50-hp gasoline engine. It will handle trees and brush up to 6 ins. in diameter and will throw the chips and shavings 20 to 30 ft. away or into a truck. The hopper is designed so that it is almost impossible for a workman to have his fingers come into contact with the planer blades.

Normally, the chopper is mounted on a 2-wheel trailer and is hauled by a utility truck. The district tree foreman estimates that, with this outfit, using the same crew, he can do in one day the same amount of work that previously required four days. Maintenance is low and consists of weekly resharpening of the four planer blades.

• • •

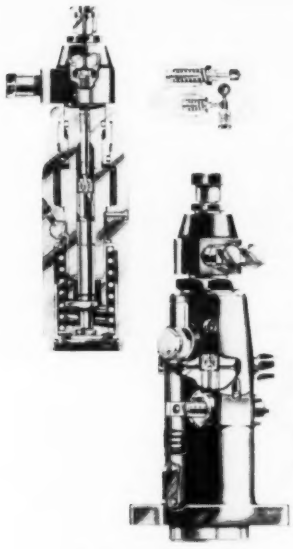
New Equipment Reduces Garbage Collection Costs

In the past fiscal year, Glendale, Ariz., purchased a new Loadpacker enclosed garbage collection unit. Though new territory was annexed, resulting in great mileage of collection routes, the same service was given with no increase in personnel. Tons of garbage collected per man-day worked was 2.6, as compared to 1.7 tons in 1945-46.



This Diesel Is Ready

FOR A CHANGE IN DIET



Worthington-designed dual plunger fuel pump.

Right now this Worthington Diesel—one of three 1760 hp units owned by the city of Tarboro, N. C.—is operating on oil.

But they anticipate natural gas in this area, and this Diesel is ready for it. With slight changes, it can easily be converted.

Worthington-designed dual plunger pumps now completely fuel this engine with oil—producing more perfect atomization, making possible the use of a *heavier* grade of oil. Also: firing pressures are reduced, exhaust temperatures, too, and combustion is improved.

When the conversion to gas is made, the dual plunger pumps will furnish pilot oil for ignition. Conversion is made quickly and at low cost.

For any engine application, call on Worthington—an engine for any fuel: oil (crude or regular), gas or "dual fuel". Worthington's complete line of engines assures you of the most economical operation no matter what fuel you use.

Only Worthington dual fuel engines offer such exclusives as dual plunger pumps, gas micro-metering valves for each cylinder, and automatic thermal air control—all built to give optimum performance for the fuel used.

Write for Bulletin S-500-B 31 C, Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.

WORTHINGTON

ENGINES

E.1.12

ECONOMICAL CONTINUOUS POWER

Diesel Engines, 150 to 2640 hp
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Evaporative Type Engine Water Coolers

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How City-Owned Automobile Control Is Simplified With Visible Records

ROBERT L. JOHNSON,
Superintendent, City Hall Garage, Board of Public Works, City of Los Angeles, Calif.

MOTOR vehicle operation is one of the most costly items in the budget of the Los Angeles Municipal Government. Because of the tremendous area embraced by the City limits, nearly all governmental activities require transportation. For this reason, a major concern of the Board of Public Works is efficient and economical operation of cars and trucks.

Efficiency calls for maximum usage which is impossible without a fast and accurate dispatching system; a system whereby management can be kept informed continually of all phases of the operation.

"Will a one-ton express be available for a week, starting at 9:30 Wednesday morning?"

"How many additional coupes shall we buy in 1951?"

These are the types of questions which can be answered only by having an efficient record keeping system.

The City Hall Garage, a division of Public Works, was established to supply passenger and light truck transportation to all budgetary departments of the City government. Growth of this organization since 1946 rendered obsolete the old dispatching system, the volume of business requiring visible filing. After inquiry into the available systems, it was decided to try the Remington Rand Kolect-A-Matic plan. It has proved to be efficient and economical, and to provide complete, automatically functioning administrative control. I now have confidence that the whereabouts and data on utilization of every automobile are immediately accessible to me and that prescribed service and repair schedules are being followed to the letter.

Methods of Procedure

This dispatching record consists of a Kolect-A-Matic tray with panels containing 281 cards. Each card is housed in an individual pocket, with a visible margin. Indexing is by the assigned number of the vehicle listed on the left of the title insert. Also found here, and available at a glance, are the make and color, license number and the control signal system.

All City employees using City-owned cars are required to obtain written authority from Department heads. For this purpose triplicate forms are used which are filled out by the employee with his name, purpose of his trip, and time of his probable return. The Department head signs the request and the employee presents the Transportation Order to the Garage Dispatcher, who assigns an available car by checking the Kolect-A-Matic record to see what cars are signalled "IN." The colored Graph-A-

NEW! A HEAVIER MODEL for HEAVY and EXTENSIVE DIGGING
Added to the Shawnee Line

SHAWNEE **SCOUT DITCHER**

The new Shawnee Scout Ditcher installs in ten-minutes on any Ferguson, Ford or Ford-Ferguson tractor.

With more powerful hydraulic cylinders with 2" and 3" bearings on each end, and more weight and power throughout, it answers the need of operators who do heavy digging.

For additional information about the new Scout, please write:

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Products:
Shawnee Ditcher • Scout Ditcher • Shawnee 'Dozer
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FEATURES:
160° operating arc.
14-ft. reach behind ditcher.
Bucket height, 10 ft. (dumping clearance with hydraulic bucket, 5 ft.)
9 ft. 6 in. digging depth (10 ft. with hydraulic bucket.)
Bucket widths: 12", 16", 18", 20".

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AUTOMATIC • PORTABLE • POWER DRIVEN
saves labor, time, money

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Cuts smoothly wherever a man can walk or row a boat, cuts evenly regardless of rough or rocky ground, removes underwater growth efficiently. Weighs only 24 lbs., has 20" cutter bar, 1¼ hp motor, beautiful aluminum construction. Runs many hours per gallon, easy to operate. Reaches all those "hard-to-get-at" places.

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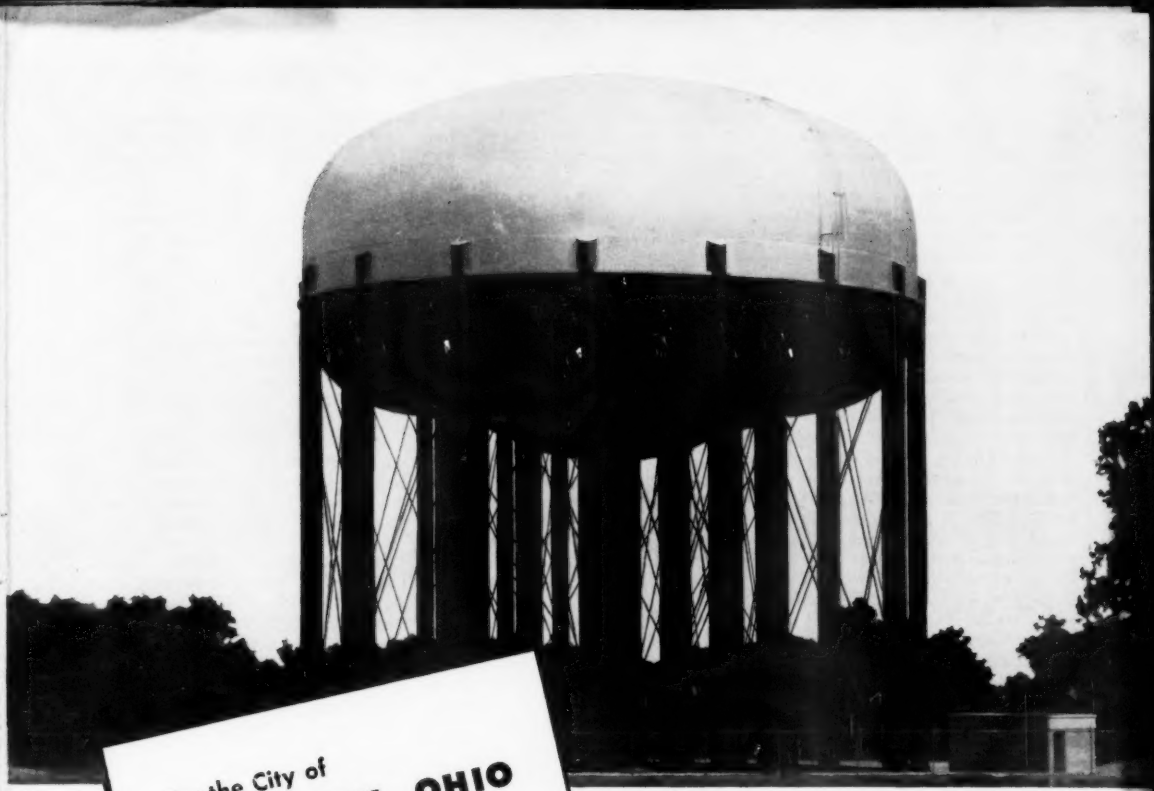

For the City of
DAYTON, OHIO

ANOTHER IMPORTANT STEP FORWARD IN LARGE-CAPACITY ELEVATED STEEL TANK DESIGN—

The *Toro-segmental Bottom* Tank by PITTSBURGH • DES MOINES

This Pittsburgh-Des Moines elevated steel tank, recently erected for the City of Dayton, is of new *Toro-segmental Bottom* design, with a water storage capacity of 2,000,000 gallons. The design carries the load by suspension of the tank bottom, rather than by beams—using less steel, and achieving lower cost. • The pleasing appearance of the tank is matched by its efficient performance: head range is but 34½ ft. The tank diameter is 102 ft.; high water line is 95 ft. above foundation tops. • Write for a consultation on your water storage requirements.

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DES MOINES (8), 943 Tuttle Street
DALLAS (1), 1247 Praetorian Bldg.
SEATTLE . . . . . 550 Lane Street
SANTA CLARA, CAL. . . . . 649 Alviso Road

Matic signal over the word "IN" printed on the visible margin tells him instantly what equipment is ready for use. The dispatcher then drops all three forms in the pocket, and slides the signal to the right to indicate the time of return. If the car is not to return for several days, the signal is placed over the correct date on the month scale printed on the left of the insert.

When the car is returned the Graph-A-Matic signal is reversed to the "IN" position, the requisition forms are removed from the pocket and completed. The user of the car gets one copy as his receipt for the return of the car and two copies go to the Accounting Department for billing purposes. Any damage to the car is noted, so that in case of inquiry the record of recent usage is immediately available.

Cars out of service are signalled in red over the figure 12 in the time scale at the right of the visible margin. Cars permanently assigned to municipal officers must be returned to the city garage for servicing on certain dates. That date is signalled in pink on the visible month scale and the record is inspected daily by the supervisor to make sure that schedules are being followed, or to initiate action in the case of cars not checked in for service on the due date.

• • •

Subdivision Sanitation

(*Continued from page 68*)

factory for subdivision with individual sanitary facilities where investigation and soil percolation tests show the presence of conditions making the land unsuitable for the disposal of sewage, drainage, or water supply development, unless special approved arrangements are made.

10). Legal action by the health department to enforce the subdivision law, public health law and sanitary code, and legal action by local officials to enforce local ordidances, when found necessary.

Enforcement Is Difficult

One might be tempted to say that surely two or three, or just one, of the controls mentioned above should be adequate to obtain compliance with the law. Although in most cases this is so, experience has proven that even these measures are not entirely adequate when dealing with certain recalcitrant, informed and influential individuals. Enforcement of a subdivision law in practice is in some cases very difficult. One successful legal prosecution, however, can aid immeasurably in future enforcement.

The Third National Public Health Engineering Conference,[7] sponsored by the Civil Engineering Department of the University of Florida, devoted the entire session to suburban sanitary services, the problems and their solution. The New York State Health Department now has under consideration revision of its present law to prevent certain evasions. Westchester County recently adopted an excellent revised realty subdivision law. These are progressive steps. Additional study, however, and new ideas to simplify and make more effective compliance with subdivision laws and policies are indicated. Until better procedures are developed a great deal of hard work is necessary on the part of health departments, sanitary engineers, designing engineers and local officials. At times, one may wonder if the time and effort required to obtain satisfactory subdivision plans, and then installation in accordance with the plans, is

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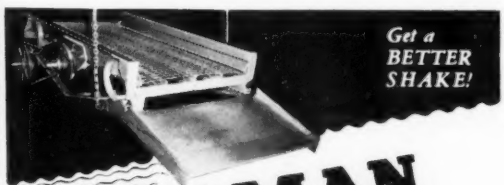

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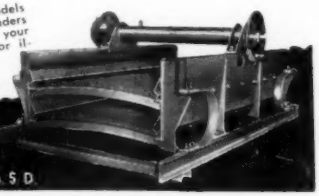
Vigorous action—action that provides high capacity and accurate sizing without transmitting vibrations to attached equipment—that's what makes the Kolman screen the screen for the construction business! And the rugged, simple construction of lightweight Kolman screens gives dependable performance, low maintenance cost. Before you buy any vibrating screen, investigate the advantages of the Kolman!

Single and multi-deck models for conveyors, bucket loaders and screening plants. See your dealer or write today for illustrated folder.



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VERSATILE...

*is the word for the Dorrco Vacuator**

Here are Three Ways it can be utilized to solve your problems . . .

AS A PRE-TREATMENT UNIT

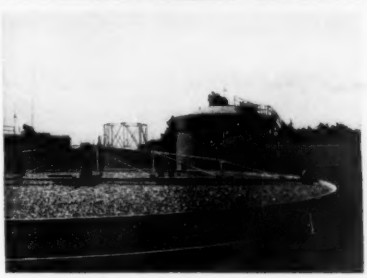
1 At overflow rates of 5000 to 7500 gal./sq. ft./24 hrs., the Vacuator can serve as a complete pre-treatment unit, removing scum, grit and a substantial percentage of suspended solids—also thickening excess secondary sludges.

EXAMPLE:

At McAlester, Oklahoma's new West Sewage Treatment Plant a 12′ dia. Vacuator removes scum, grease and grit from incoming screened sewage, prior to two-stage trickling filter treatment. Operating results show removals of 46.6% of suspended solids and a 28.4% reduction in B.O.D.

AS A SCUM-REMOVAL UNIT

2 At overflow rates of 5000 gal./sq. ft./24 hrs., the Vacuator can be used for the treatment of oil, cannery, packing house, laundry and similar tough-to-handle wastes.

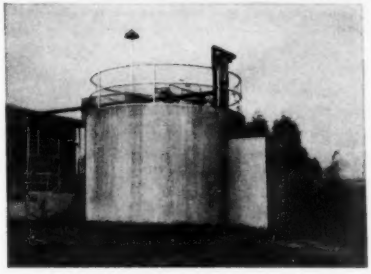


EXAMPLE:

Scum-forming cannery wastes virtually put the Palo Alto, California Sewage Treatment Plant out of commission five months of the year. A 35′ dia. Vacuator, followed by secondary treatment, completely solved the problem by removing an average of 43.6% of suspended solids, 58% of settleable solids and 8.4% of B.O.D. during the canning season.

AS A GREASE-REMOVAL UNIT

3 Overflow rates as high as 10,000 gal./sq. ft./24 hrs. can be used when the primary function of the Vacuator is grease removal from domestic or industrial wastes.



EXAMPLE:

At Patuxent River, Maryland, a 14′ dia. Vacuator removes heavy "slug loads" of grease ahead of primary treatment. Removals average 50% of suspended solids and a 51% reduction in B.O.D., enabling the standard Dorr Clarifier which follows to function smoothly without auxiliary equipment.

These examples illustrate but three of the many ways in which the compact, three-product Vacuator is successfully solving difficult problems. If you think vacuum-flotation could help you, write for Bulletin #6301.

*Reg. U.S. Pat. Off.

DORRCO

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THE DORR COMPANY · ENGINEERS · STAMFORD, CONN.

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commensurate with the results: that is, until the persistent missionary, educational, engineering and administrative efforts begin to produce a return.

Preparation of Subdivision Plans

The New York State Health Department has prepared Bulletin 40 "For the use and guidance of consulting engineers, owners of realty developments and other individuals interested in the subdivision of land." The type of plan required, information to be shown and steps to follow in the preparation and submission of plans are carefully explained. Some bases of design are included. Details, sketches and typical designs showing satisfactory examples have not been included, possibly for the reason that there is a tendency to copy these examples mechanically without regard to their suitability to the local conditions and possibly because this information is available in Public Health Service, Federal Housing Administration, State and County Health Department pamphlets.

In areas having subdivision laws which are enforced, such as in New York State, a great deal of assistance is available through state district health offices and county and city health departments. The health department sanitary engineers and their representatives confer with developers and their engineers and help interpret the intent of the law. They make joint investigations of the property, assist in making soil percolation tests, consult with the designing engineer, review designs and plans, and in general expedite submission of satisfactory subdivision plans. In some local health departments, as in Buffalo—Erie County, New York, plans are approved by the sanitary engineer and construction is inspected for compliance with the plans. These are some of the services rendered by properly staffed health departments in carrying out one of their routine preventive programs. But the assistance and cooperation of all interested individuals and agencies is needed to obtain maximum effectiveness in the control of subdivisions.

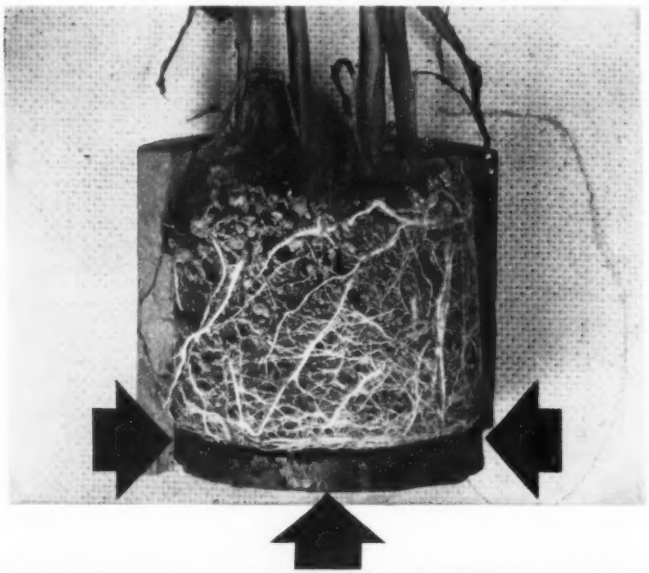
References

1. *Environment and Health, FSA, Public Health Service Publication No. 84, 1951.*
2. *Hall, George, L., Controlling Water Supply and Sewerage in Subdivisions, Public Works, Oct. 1950.*
3. *Kiker, J. E., Water Supply and Sewerage Facilities for Realty Subdivisions, Fla. Engr. Soc. Jour., Vol. 2, No. 4, Dec. '48, p. 30-48.*
4. *Annon. "A realty company takes responsibility: It builds and operates a sewage plant", Engr. News-Record, Mar. 1, 1951.*
5. *Richey, R. T., Sewage Treatment for Industrial Housing Expansion, Public Works, Nov. 1949.*
6. *New Jersey Home Builders Install Own Sewage Disposal Plant, The American City, July 1951.*
7. *Proceedings of the Third National Public Health Engineering Conference, Bul. Series No. 42, Fla. Eng. and Ind. Exp. Sta., Univ. Fla., Gainesville, Fla.*

● ● ●

Ship Sewage Disposal

The Ship Hotel Corporation moored a large houseboat adjacent to the Sandy Point, Md., ferry slip to provide living quarters for construction crews engaged in work on the Chesapeake Bay bridge project. Several plans for the disposal of sewage from the houseboat or floating hotel were discussed with the owners. The most satisfactory arrangement seemed to be to store the sewage in holding tanks located in the hull of the ship, pumping



PORTRAIT OF ROOT RESISTANCE ... with ATLAS JC-60 Sewer Joints

Words could not tell a better story about root resistance than the above photograph. It is proof that roots cannot penetrate an ATLAS JC-60 joint. It is proof also that your investment will not be lost to this most common form of sewer line destruction.

JC-60 is a plastic base sewer jointing compound that resists roots BOTH ways: *Hardness* prevents penetration into the compound: *adhesion* prevents roots from entering between the jointing compound and the pipe. No other compound provides both characteristics to this degree.

By every standard, JC-60 excels. It is not affected by thermal shock . . . does not ignite . . . does not deteriorate when overheated. JC-60 has excellent tensile strength, outstanding adhesion, and good flexibility.

Send for Bulletin M20-2

OTHER ATLAS PIPE JOINTING MATERIALS
For Sewers: GK,® Slipjoint GK,® Atlastic 77. For Cast Iron Water Pipe: Tegul-MINERALEAD,® Hydrorings
ATLAS JOINTING COMPOUNDS ... a permanent bond

ATLAS MINERAL PRODUCTS CEMENT MERTZTOWN PENNSYLVANIA HOUSTON 1, TEXAS

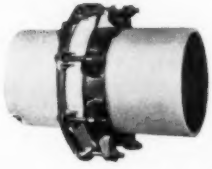
Get full details of this month's new products . . . mail your Readers' Service card today.

EMERGENCY REPAIRS

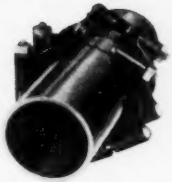
Here are 6 safe, sure ways to repair *damaged lines quickly*

It is no more than prudent to be prepared to handle emergency damage quickly and effectively. Many cities are seeing to their stocks of the Dresser products illustrated here, knowing that even unskilled civil defense volunteers can install them with a minimum of training. Resilient rubber gaskets provide lasting protection against vibration and shock.

Be sure you have complete information on these products and their use. See your Dresser Sales Engineer or write to our Bradford Office for details.



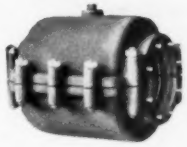
Dresser Bell-Joint Clamp (Style 60) makes permanent, flexible repair on blown or leaking bell and spigot joints. Fully adjustable. High uniform gasket pressure. Sizes 3″ to 60″.



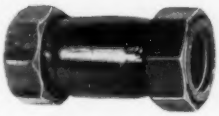
Dresser "Adjustable" Sleeve (Style 82) makes quick, permanent repairs on cast iron lines. Light in weight, low in cost. Adjustable for perfect fit. Sizes 4″ to 8″.

Dresser Split Sleeve (Style 57C) for repairing breaks, splits and holes in cast iron pipe. Rugged-ly built. Sizes from 2″ to 12″.

Dresser Coupling (Style 38) makes it easy to cut in a new length of pipe to replace a damaged section. The only tool needed to install it is a wrench. Sizes $\frac{3}{8}$″ to 72″ and up.



Dresser "Bell-Pack" Sleeve (Style 126) encloses split and broken bells, mechanical joints. Factory assembled, ready to use. Sizes 3″ to 24″.



Dresser "Super-Service Fittings" (Style 90) is extremely rugged joint for service lines. Flexible—withstands vibration and shock. Complete line including ells, tees, adaptors. Sizes from $\frac{3}{4}$″ to 2″.

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Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries)—Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Bayshore Highway, South San Francisco, Cal.—Sales Offices: New York, Philadelphia, Chicago, Houston, South San Francisco.

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either to barges or tank trucks and conveying the sewage to the sewerage system of the Annapolis Metropolitan Sewerage Commission for disposal. However,. the ship owners obtained a point of disposal on a farm about four miles from Sandy Point where a large pit was dug and the sewage carried in tank trucks from the ship and discharged into the pit. Inspections showed that this operation was being carried out satisfactorily and causing no nuisance conditions in the surrounding area.—From the 1950 Report of the Bureau of Sanitary Engineering, State Dept. of Health, Md.

• • •

Flexible Pipe Facilitates Water System Construction

DESIGNED to serve three small communities in West Virginia —Pax, North Branch and Wierwood —a new $130,000 water works improvement has been constructed which has one specially interesting feature. Pax is the first corporation in the United States to use plastic pipe for a municipal water supply and distribution system. The use of this pipe was dictated largely by local conditions of soil and topography. Pax is wholly surrounded by steep hills; solid rock is usually found about 3 ft. down; and the soil is strewn with boulders. Plastic pipe did not need to run in straight lines, and thus was particularly suitable for zigzagging between boulders and rock outcrops.

The terrain is so irregular that the consulting engineer, Dennis M. Leary, Jr., Beckley, W. Va., plotted the distribution system layout from specially made aerial photographs. There were three pipe line crossings under the Virginian Railway tracks.

The three villages have a total population of about 1400 and 262 homes will be served at an estimated minimum of $3 per month each. The water comes from a well in Long Branch, another nearby mining community, and is treated. A 100,000-gallon storage tank provides a reserve supply.

● *PLASTIC pipe rolls into irregular trench.*

● *QUICK joints facilitate pipe installation.*

HELPING AMERICA GET THINGS DONE

Once again the Armed Forces are demanding FRINK SNO-PLOWS for snow removal where speed and reliability are an absolute necessity.

The specifications are strict and the FRINK easily qualifies because of sturdy construction. Its many exclusive features have been tested under all snow conditions, in major snow areas, and the 18 plows that make up the FRINK line provide faster and more economical snow removal.

Write for information regarding the FRINK features. FRINK PLOWS are available for trucks with capacities from 1½ to 12 tons.

For Further Information Write Box P51W, Clayton, N.Y.

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DAVENPORT-BESLER CORP., DAVENPORT, IOWA
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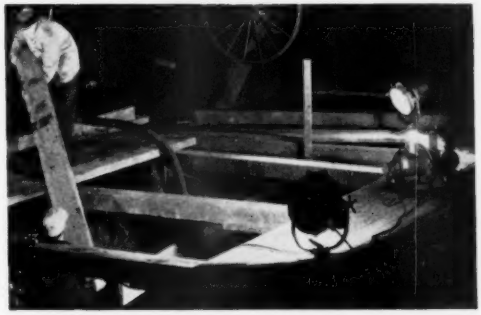
Homelite Carryable Generators. Night work used to be slow work . . . and expensive work . . . but not any more. With a lightweight, carryable Homelite Gasoline Engine Driven Generator you can have, in no time and with no trouble, all the brilliant floodlights you need to speed work and cut costs in emergency night repairs. What's more, using your Homelite Generator to operate new, efficient electric tools pays off plenty in important savings in time and labor at all times, night or day.



Homelite One Man Chain Saws. For clearing storm damage or new construction sites, nothing approaches the efficiency and man-hour savings offered by the new Homelite Gasoline Engine Driven Chain Saws. Only 27 pounds, complete with 4 horsepower engine, will cut wood easier, faster, and with less trouble or maintenance than any other saw. One man can handle it easily. In fact, with the Homelite Saw one man can do more cutting in fewer hours than you would ever expect.

Send today for complete information on all Homelite Carryable Cost Cutting Units

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PUBLIC WORKS DIGESTS

THIS section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

WATER WORKS . . 86
SEWERAGE AND REFUSE 102
HIGHWAY AND AIRPORTS . . 94

THE WATER WORKS DIGEST

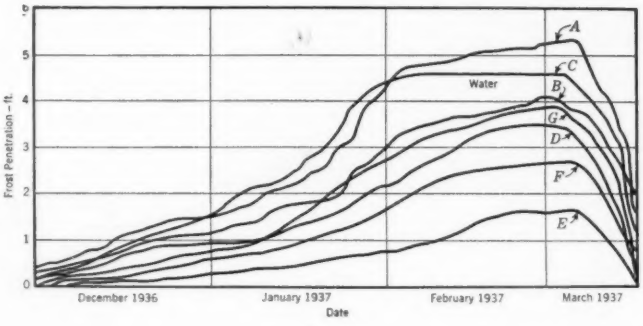
Frost Penetration In Montana Soils

Factors directly affecting frost penetration are: 1—Air temperature and its duration; 2—Character of the soil; 3—Amount of moisture in the soil; 4—Density of the soil; 5—Texture of the soil; 6—Color of the soil. The author kept daily records for four months of the rate of frost penetration in different soils, and has plotted them in the accompanying illustration. He found frost penetration to be most rapid and deepest in soils containing the most moisture, and stopping completely at point of saturation. But there are inconsistencies in frost penetration for which no reasonable explanation seems to exist.

John W. Hall—"Frost Penetration in Montana Soils;" *Journal, American Water Works Ass'n*, November.

The most important factors that affect the location of the frost line (the greatest depth at which soil freezes) are the type of soil, average yearly temperature of the ground, time from the start of freezing temperatures, and snow on pavement cover. Meteorological factors such as wind velocities and the amount of sunshine and clouds affect the frost line somewhat but can usually be disregarded.

James Petrica—"Relation of Frost Penetration to Underground Water Lines;" *Journal, American Water Works Ass'n*, November.



Key

Line	Hole No.	Composition	Characteristics
A	1	30% sand; 70% gravel	Hard and damp
B	2	30% sand; 70% gravel	Slightly damp
C	3	30% sand; 70% gravel	Very damp
D	4	30% sand; 70% gravel	Very dry
E	5	100% black loam	Very dry
F	6	80% black loam; 20% gravel	Slightly damp
G	7	100% yellow gumbo	Very hard and dry

Courtesy Journal AWWA

● ***VARIATIONS in frost penetration in Montana.***

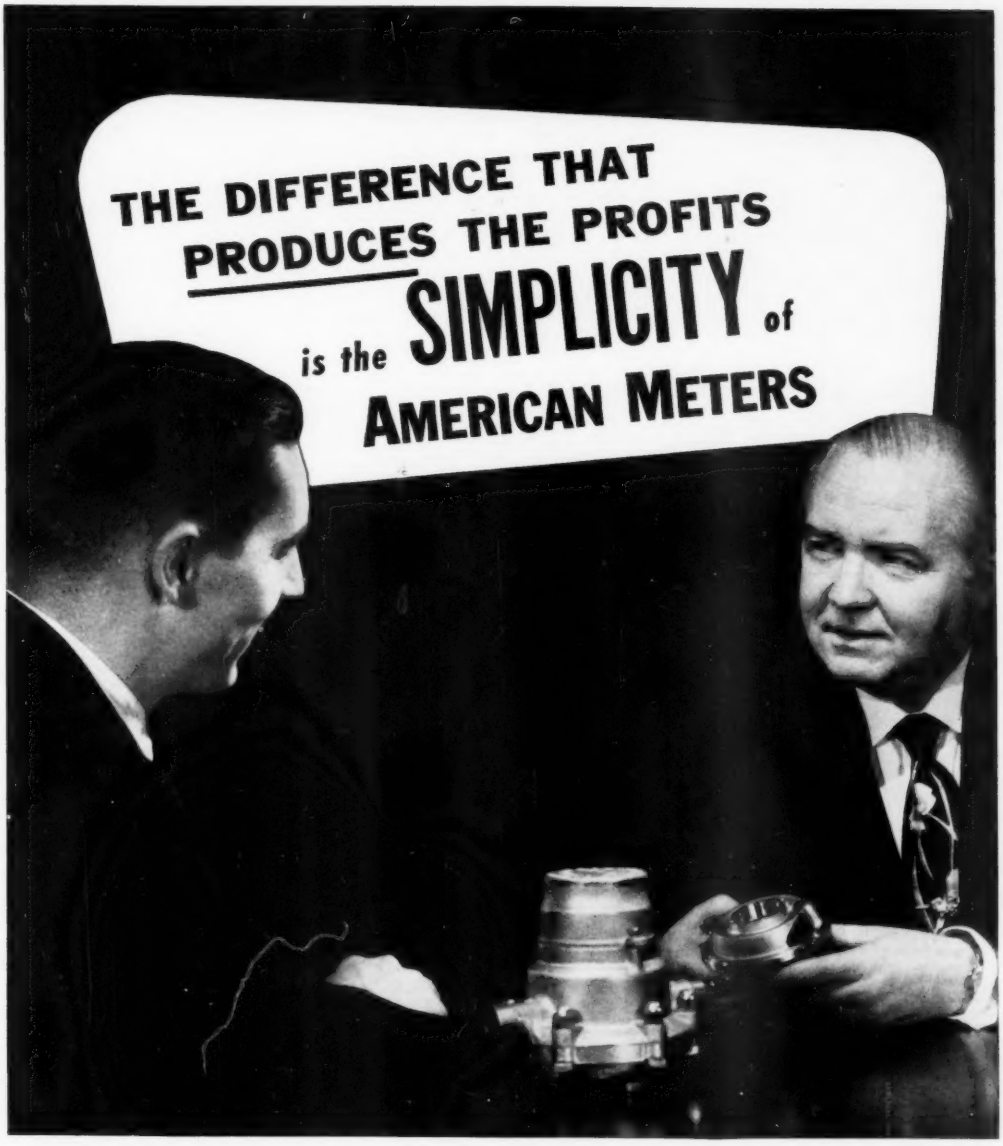
Concrete Tank Stressed Vertically

A concrete reservoir for Wausau, Wis., 168 ft. in diameter and 16 ft. high was stressed circumferentially with steel wire by the Prestressed Concrete Corp.'s method, and in addition was stressed vertically. Prior to pouring, 412 units of 6 rods each were anchored in the base at equal intervals around the wall. After the wall had been poured, a 60-ton jack at the top of the wall pulled each of the units to 120,000 lb. per sq. in.

"Two-Way Squeeze on Concrete Tank;" *The Constructor*, December.

Chromium Contamination Of Underground Water

The U. S. Public Health drinking water standards state that "The presence of hexavalent chromium in excess of 0.05 ppm shall constitute grounds for the rejection of the supply." The water supply of Douglas, Mich., is obtained from wells located approximately 1,000 ft. north of the waste pond into which chromate wastes were discharged, and three years after the initiation of such disposal of these wastes, concentrations of 10.8 ppm were found. In Nassau County, N. Y., there are a number of aircraft plants which use chromic acid for amodizing aluminum parts, and wastes containing it are dumped into ponds or wells in the sandy soil. The water supplies in the county are obtained by means of wells, and there are many private wells. Examinations of the water from a large number of these wells showed only a few with positive tests for hexavalent chromium, but a few showed 0.1 to 3.5 ppm. Beginning in 1948, all large consumers of chromic acid in Nassau and Suffolk have installed treatment



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plants in which chemical precipitation is employed, which is capable of almost complete removal of this toxic element. An interesting incident that may be considered as evidence in toxicological study of the water was the discovery of a family which has for several years been using water from a private well that has been found to contain 1.0 to 25.0 ppm of hexavalent chromium, with no apparent ill effects.

Herbert W. Davids and Maxim Lieber—"Underground Water Contamination by Chrominum Wastes;" *Water & Sewage Works*, December.

Handling Ton Chlorine Tanks

Richmond, Va., in 1935 installed an outdoor storage and gassing chamber for ton chlorine containers. This was used until 1950, when it was superseded by an indoor installation with concrete cradles for 14 chlorine containers, 4 for ammonia and 2 for sulfur dioxide. Outdoor installation eliminates the necessity for providing fans and ventilating systems, but the containers are exposed to wind, rain, snow and sun. At high gassing rates, frost will form on the containers and the rate of gas delivery will be reduced unless external heat is applied, so warm air from the heating system in the filter plant was blown through 4" clay pipe to a point under the center of each container. This, supplemented by fin heaters regulated by thermostat maintains the temperature at approximately 70° F. In the new indoor plant, ventilation is provided by two centrifugal fans, one of 14,000 cfm capacity, the other of 885 c.f.m., which discharge into flues that discharge above the building and are operated by push buttons located outside the gassing room.

Most large users of chlorine heat it by means of a temperature-controlled water bath around the container or use an evaporator. In the Richmond plant the gassing room hot water heating coils are supplied by a separate circulator pump operating direct from the boiler, controlled by a thermostat located near the floor; additional heat, when needed, being furnished by electric steel fin strip heaters controlled by manually operated switches. Two pressure-reducing valves reduce the tank pressure to 25 psi.

H. E. Lordly—"Chlorine Handling Facilities at Richmond's Filter Plants;" *Water & Sewage Works*, December.

Iron Removal from Illinois Ground Waters

There are approximately 536 public and institutional ground water supplies in Illinois. The iron content of these ranges from 0.0 to 30.1 ppm and 116 plants practice iron removal, using one of seven methods approved by the State Dept. of Public Health: 1—Coke tray aeration, retention and filtration; 2—Contact filters; 3—Pressure aeration; 4—Base exchange; 5—Catalysis materials; 6—Lime softening; 7—Sequestration. The manganous zeolites which require regeneration with potassium permanganate are not accepted by the Health Dept. for iron removal from public supplies. Coke tray aeration is the method most generally employed in that state. There is one plant using a catalysis material—"Birm"; and one using sequestration, feeding hexa-metaphosphate direct to the wells. Iron removal is incidental to lime softening, but this is one of the most efficient methods for iron removal.

Kenneth E. Cowser—"Iron Removal Practices with Illinois Ground Waters;" *Water & Sewage Works*, December.

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Water Pollution Control Standards

This article analyzes and compares the pollution control regulations of New York State and those of the International Joint Boundary Com'n. relative to pollution of the St. Lawrence river and the Great Lakes. "The trend is toward defining pollution as the presence of wastes in amounts *only* which make each water unsuitable for its most important usages in the locality." Some categories from which the most important usage are selected are: drinking, food processing, fish culture, fish survival, bathing and other forms of recreation, agriculture, navigation, industrial processing, industrial cooling, disposal of sewage and industrial wastes. New York State standards provide 7 classes for fresh surface waters, 4 classes for tidal salt waters and 2 classes for underground waters. Criteria of quality in relation to specific usages usually employed are: 1—Characteristics such as BOD, acidity, alkalinity, pH, color, temperature and chlorine demands. 2—Broadly classified substances, such as suspended, settleable, dissolved and floating solids, sludge deposits and oils. 3—Specific substances such as DO, phenols, compounds of ammonia, cyanide, copper, zinc, lead, chromium and iron. 4—Coliform organisms and other biological characteristics. The New York standards are limited to receiving waters; those of the International Com'n include both effluent and receiving waters. The only difference between the two as to quality of receiving waters is a slight difference in the pH limit.

Raymond W. Hess—"Water Pollution Control Standards and Objectives;" *Water & Sewage Works,* November.

Reinforced Lead Pipes

A research group of the Institution of Water Engineers (England) has developed a reinforced lead pipe, which has the advantages of flexibility, and availability in lengths, up to 200 yd.; has thin walls, reducing the weight to 1/3 that of standard lead pipe; safe working pressures up to 350-400 lb. per sq. in. can be withstood. It could be supplied in sizes up to 3 in. i.d. The lead tube is strengthened by an outside wrapping of steel or bronze tape, with a layer of paper between the lead and tape and an outer sewing of bituminous paper or other protective coating. At present pipe with ¾ in. bore is being manufactured by a cable manufacturing firm.

"Reinforced Lead Pipes;" *The Surveyor,* Dec. 15.

Synthetic Rubber Pipe Joint Rings

Rubber pipe joint rings were first used in England in 1863; in the United States in 1870. Manufacturers of rubber and pipe joints for many years studied in cooperation to develop the rubber compound most satisfactory for this purpose. There are 24 recognized grades of crude rubber, and differences within the same grade of rubber from different plantations. During World War II, scientists employed by the Federal government developed several synthetic rubbers, and in 1945, pipe joint rings of synthetic rubber went into production. Severe tests of these have shown that they perform equally as well as and sometimes better than the best natural crude rubber rings. They offer more uniform resistance to compression,

when water pressure means the most

City officials, municipal and industrial engineers shoulder a tremendous responsibility in the maintenance of water pipe lines. They know that pressure failure due to leakage or tuberculation can often have disastrous results.

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W. L. White—"Comparison Between Synthetic and Natural Rubber Pipe-Joint Rings;" *Journal, American Water Works Ass'n*, November.

Tracing Underground Water

In making certain investigations in the Libyan Desert of Egypt, the author desired to learn whether water in damp sands in the lowest part of a certain basin was brought by underground flow from three springs about 7 miles away, the water from which disappeared into the ground within a few yards of its point of emergence. The soil was sand containing large amounts of salt brought in by the winds from the sea. Any chemical or dye used as a tracer should remain in solution and not be precipitated or absorbed by the limestone, gypsum or salt in the sand. Either methylene blue or fluorescein would probably be so diluted that the color could not be recognized. The use of a radioactive isotope suggested itself, and on the advice of Isotope Developments Limited of London he obtained some rubidium chloride which had been "cooked" in an atomic reactor and made radioactive, with a half life of about 19 days. He also obtained an instrument which would detect the Beta-rays ejected by the rubidium. A solution of 1 cc of a 10% solution of the radioactive rubidium to a liter of distilled water was poured into the water flowing from one of the springs. Five days later the water in the sands was distinctly radioactive, which it had not been before. This seemed to prove that it had reached there by underground flow from the springs.

Sir Cyril Sankey Fox—"Radioactive Isotopes Trace Underground Waters;" *PUBLIC WORKS*, Jan.

Reducing Unaccounted-for Water

Monroe, Wisc., population about 7,000, obtains its water supply by pumping from wells. In 1948 there was 30.88% unaccounted for water; one year it had reached 40.98%. In May 1948 a new superintendent, Z. A. Gorder, was appointed, and by the end of 1950 he had reduced the unaccounted for water to 15.21%. A complete valve survey disclosed that, of more than 300 valves, a large number were leaking badly; one had a broken stem. Only 5 valves were provided with manholes. Many leaking hydrants were found and at least 30 were pulled and repaired. Over 250 meters were purchased and installed and obsolete ones scrapped. Leaks in mains are repaired as soon as discovered.

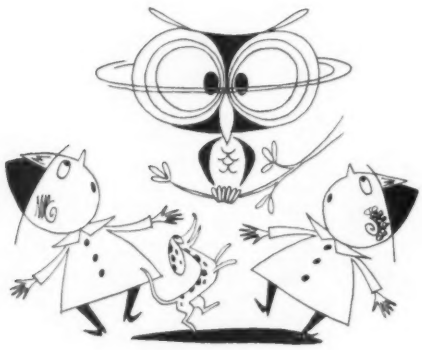
"Water Sales Increase While Unaccounted-For Losses Drop;" *Water Works Engineering*, Dec.

Technical Practices In Cathodic Protection

In the application of cathodic protection, the following questions arise: 1—How much protective current is required? 2—Where should the current supply points be located? 3—What type of power supply is best suited to the particular job?—4 What kind of ground bed should be used? 5—Are the protective currents likely to stray to other structures and cause interference or electrolysis? Answers to these questions are contained in the latest bulletin prepared by the Correlating Committee on Cathodic Protection and published in the AWWA Journal under the head:

"Technical Practices in Cathodic Protection;" *Journal, American Water Works Ass'n*, November.

Head turns all the way around



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Unusual Construction Method for Big Boston Pipe Line. January, Pp. 41-42.
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Chlorination for Swimming Pools

(*Continued from page* 61)

certain cases, as when the pool contains an extremely large amount of organic matter, post-chlorination is desirable. In general, however, post-chlorination is not as widely used as pre-chlorination, and is more limited in its scope.

With the fill-and-draw pool, the application of chlorine is effective because it not only helps the pool owner to obtain a safe clean water, but also results in appreciable savings on the water bill, since the chlorinated water can be used for a much longer time before drawing it off.

In a typical fill-and-draw chlorinator installation, some of the pool water is pumped from the deep end and returned to the pool through a grid pipe, which has a series of holes drilled in it, running the width or periphery of the pool and located about one foot above the pool floor. Before being pumped through this grid, the water is chlorinated.

It is especially important to note that the effectiveness of this sys-

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tem is due chiefly to the multiplicity of points at which the chlorinated water is applied. Such a method of application ensures good circulation of chlorinated water to all parts of the pool and means that the residual will be carried throughout the entire pool.

Flow-through pool chlorination is a highly individual problem depending upon such factors as the kind of supply; inlet and outlet location; rate of flow; circulation; etc., and should be given individual study by an expert in chlorination.

The large outdoor body of water usually involves a pond or small lake. Effective results hinge upon the proper application of chlorine from a multiplicity of outlets to eliminate any dead spots in the pool and thus insure adequate residuals throughout. In a typical case of this kind the water at the inlet to the lake or pond is chlorinated. Then this chlorinated water is applied by means of circulation lines containing outlet jets at points in all parts of the pond. These circulation lines extend into key parts of the pool; for example, around the edges close to the shore, near the center of the pond, etc., depending on pool circulation.

After determining the type of residual desired, the form of chlorine to be used, and where it should be applied, the modern pool owner has one more important decision: He should select suitable, accurate and dependable equipment.

• • •

Combining Filters and Activated Sludge

The following is slightly condensed from an article in the English weekly *Municipal Engineering*. While winter weather and other conditions in England differ from those in most parts of North America, we believe that the author's ideas are worth careful consideration by treatment plant designers and operators in this country.

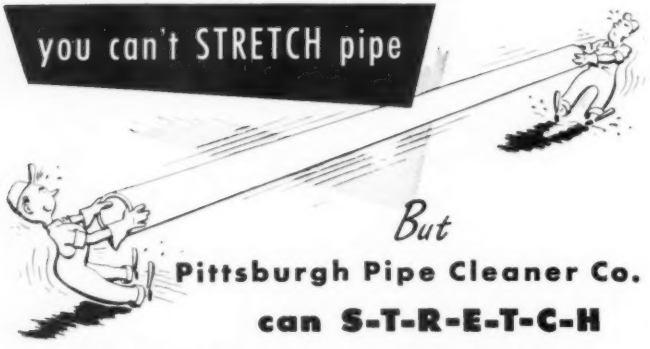
It is generally recognized that the best time for purification by percolating filters is during the summer months. It is common to find that about late April or early May, both the appearance and the performance of the filters begin to show an improvement. Provided the plant is not being too badly treated by overdosing, toxic wastes, bad operation or other factors, the results should have become quite good by July.

This high performance is normally maintained until about the end of September, after which the quality of the effluent usually begins to show signs of deterioration.

The appearance of the filters often bears a fairly close relationship to their performance. By the end of winter, most filters, unless they are lightly loaded, are showing more or less obvious signs of blockage. This may range from a few spots showing signs of ponding, to a condition in which most of the filter is under water.

If ponding is not too pronounced, it will usually disappear during the summer, owing to the seasonal high activity of scouring organisms, sometimes assisted by the forking or raking of the filter surface.

Unless the filters are clean in the early autumn, the winter is likely to be a rough one for the operator. Anyone who experiences filter ponding in the late fall has my sympathy. Before the winter is out, producing a respectable effluent is probably going to make him scratch both his head and his filters.



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Some activated sludge plants do not appear to experience any pronounced seasonal variations, the efficiency of their work remaining reasonably steady throughout the year. On the other hand, some works of this type find the summer, with its septic sewages and low oxygen saturation values, a trying time.

The effluent may change from good to bad in a very short time; unfortunately, the return journey —from bad to good—is sometimes much slower. Reducing the loading, when this is possible, and using a high rate of sludge return or recirculation, if you like to put it that way, are the usual methods for restoring the efficiency of the plant.

It has to be admitted that when activated sludge plants develop these summer tantrums (some do not suffer from this complaint), they are misbehaving at the worst possible time of the year. That is to say, they have their off spells in hot, dry weather, when stream flows are low and bad effluents are likely to have the most serious consequences.

Filters on the other hand, are usually on their best behavior in summer, when a good performance is most necessary; in winter, when they tend to fall off, stream conditions are not usually so critical.

There is much to be said in favor of having both activated sludge and filters on the same works. I do not mean the use of activated sludge for bio-flocculation as a preliminary stage, followed by filters for the final stages of purification—I mean filtration and activated sludge units in parallel, each process being used for complete purification.

This is not just a theory—it works excellently in practice. In summer, when the activated sludge units may need coddling, the filters are at their best and are capable of taking more than their fair share of the load. In winter, the activated sludge units can shoulder more of the burden. This facility for adjusting the load from one type of process to the other is a useful practical asset. It gives a flexibility which is most valuable in maintaining a decent effluent all the year around.

Sewage works engineers may not take kindly to this idea of designing works consisting half of filters and half of activated sludge; they may prefer to stick to one system or the other. Nevertheless, it is worth thinking about, particularly where site conditions and levels do not make such a dual scheme too complicated.

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To cut pipe tunnel at Marion, Ohio, George J. Igel & Co. needed 110 cfm at 100 psi to run their Ka-Mo drill. A Jaeger Model 125 did the job easily after a 105 ft. unit tried and failed.
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Value of Soils Analyses

A soils laboratory has been part of the working equipment of Oneida Co., N. Y. highway department, and they believe that the cost of soil studies has been paid back many times over and that they have minimized failures and built longer life into their pavements and structures. By means of the information obtained by their soil surveys, they are able to reach engineering conclusions and recommendations concerning the suitability of a material for embankment purposes; the susceptibility of material to frost action; the thickness of gravel base required under flexible pavements; the treatment of unstable material in subgrades; bearing pressures of soil material at bridge sites; the estimated cost of special work recommended; the location and acceptability of construction materials; and the control of failures in the older highways.

The county purchased a soil sampling kit for $200, complete with metal carrying case; and shovel, pick, sledgehammer, etc. for $18.50. For the laboratory they obtained kits for compaction testing and soil stabilization testing, and miscellaneous laboratory equipment and eight books on soil mechanics. The total cost of all, including $400 for a 15 x 30 ft. frame building, was $966.

Walter J. O'Brien—"Soils Analyses Work for Us." *Better Roads*, December.

What Size Motor Grader?

The motor grader is almost indispensable for any highway department. It plows snow, cleans ditches, cuts down shoulders, blades gravel, mixes and spreads bituminous materials. Asked what size of grader they considered best for their own work, 21 highway officials were quite generally agreed in preferring the 100-hp grader, with either tandem or four-wheel drive. In regions where there is a great deal of snow, the big graders are able to clear the roads quickly and easily. But some engineers prefer the 75-hp grader, saying it can do everything a grader is required to do. One said the heavier unit is too clumsy to handle and tends to get stuck in soft ground. Many departments that have comparatively large fleets of graders, use light units for maintenance of low-traffic dirt or gravel roads; their main disadvantage appears to be that operators try to make them do jobs too big for them.

"Most Practical Size of Motor Grader." *Better Roads*, December.

Rubber Pavement In California

As have several other states, California has laid an experimental rubber-asphalt pavement. The test section is 2961 ft. of the outer eastbound lane of a 4-lane highway, U. S. Route 40. About half of this length contains 7% of powdered rubber, the remainder contains 5%. The rubber was added to the dry mix, and mixed dry in the pug mill for 20 seconds; then the asphalt was added and mixing continued for 15 seconds. The mixture was spread on the road at an average temperature of 250° F. No noticeable differences between the mix containing rubber and that containing no rubber were observed, during spreading or compaction, or in laboratory tests except some tendency toward higher cohesion of the rubber mixture. The cost of placing the experimental section was $5.42 per ton; that of the regular plant mix, $3.34 per ton. However, the cost of the rubber mix would have been appreciably less if the entire plant had been set up for that purpose. It was estimated that, with such a plant, the cost for plant mix with 5% reclaimed rubber would be $8,402 per mile; while the cost for regular plant mix is approximately $7,370. Profilograph records taken after a month or two of use showed no discernible difference in roughness or riding qualities between the pavements with and without rubber. Skid resistance measurements showed no measurable difference in friction coefficients on dry pavements, but the rubber-treated section showed slightly higher coefficients on wet pavements.

Ernest Zube—"Powdered Rubber: Its Experimental Field Use in Bituminous Plant-Mix Surfacing:" *California Highways and Public Works*, November-December.

Conserving Steel In Concrete Paving

The necessity to conserve steel requires highway and street departments, in constructing concrete pavements, to use the least possible amount of steel in such construction. The same necessity existed in the early 40's, and in 1942 there was published a report prepared by a committee of the Highway Research Board—"Design of Concrete Pavements Requiring a Minimum of Steel." Based on this, supplemented by later experiences, recommendations are given in this article.

Steel is used as distributed reinforcement; for load transfer devices at transverse expansion or contraction joints; for deformed metal plates for longitudinal hinged joints; and for tiebars across longitudinal joints. As 3 of these 4 uses occur at joints, limiting the number and nature of joints is a primary consideration. With expansion joints placed at long intervals and dummy groove joints between, few dowels are needed, and they can be omitted altogether if the slab ends are thickened to make them structurally adequate without load-transfer devices. The use of deformed metal plates at longitudinal joints can be eliminated by using the dummy-groove type of longitudinal joint. Under some conditions, tiebars may be eliminated or reduced in quantity; they are not

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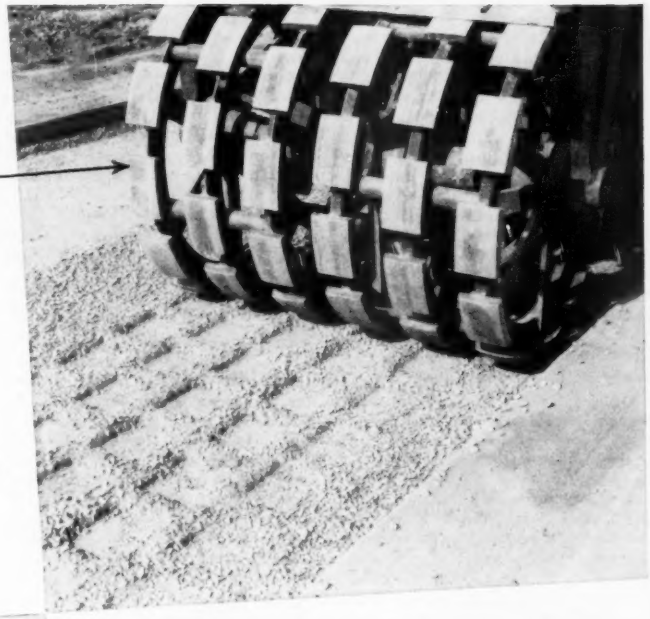

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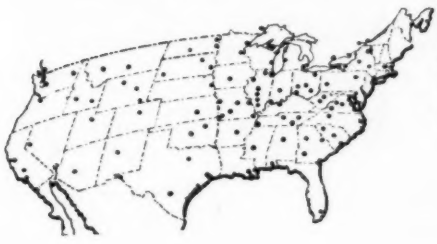

The Buffalo-Springfield Gardner roll is interchangeable with the smooth-faced guide roll on Buffalo-Springfield Tandem models KT-19, KT-20, KT-24B and KT-25B tandem rollers. It is also furnished for previously manufactured Buffalo-Springfield models KT-24 and VT-30.

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needed where the pavement is confined by curbs or otherwise so that the slabs cannot separate along the longitudinal joint. Distributed reinforcement can be omitted without sacrifice of load-carrying capacity or serviceability if the pavement is jointed so as to control intermediate cracking; which can be effected by so placing dummy-groove joints as to divide the pavement into slabs 15 to 25 ft. long.

"Conserving Critical Materials in Construction of Concrete Street Pavement;" *PUBLIC WORKS*, January.

Plant-mix Carpet-Coat Seals on Low-Type Roads

Orange County, Calif., after extensive studies of methods of maintaining its oiled roads, has chosen a new plant-mix carpet-coat seal in place of the old bituminous binder and stone chip method. With the latter, it is difficult to obtain just the right proportion of rock and oil, respectively, and traffic should stay off until the oil has had time to set up. The hot-mix carpet coat is a simple operation, virtually mistake-proof. It takes care of holes and depressions which had to be built up by preliminary patching when the old method was used. Traffic can be admitted to it as soon as the material has been spread. A ⅜ in. plant mix surface costs approximately $950 per mile 18 ft. wide; the oil binder-and-chip coat costs about $600. But the life of the former is about twice as long and the surface more satisfactory for traffic.

Harold Sprengle—"Hot-Mix Carpet Coat Seals County Roads;" *Contractors and Engineers Monthly*, January.

Vacuum Cleaning California's Roads

So much litter—beer cans, bottles, ice cream cups, etc., are thrown onto the sides of the roads in California that the maintenance forces have not the time to pick them up by hand. A road magnet would pick up the cans, but not bottles and papers. A Leaf and Litter Collecting Unit, made by the Good Roads Machinery Co., with a vacuum-producing fan, sucked up everything, even half-gallon demijohns. But these heavy articles were destructive of the fan, and the shop forces developed a modification of the machine. A separate air-tight compartment receives the heavy objects without their going through the fan. The flexible 10-in. hose is provided with a handle bar by which its opening can be moved across a strip 5 ft. wide. In cleaning up a particularly messy section on the Coast Highway, 12 loads or approximately 150 cu. yd. of bottles, cans and trash were picked up in three days.

W. D. Sedgwick—"New Vacuum Cleaner Gathers Trash Motorists Throw on Highways;" *California Highways & Public Works*, November-December.

Refining Unsatisfactory Aggregates

Because of the enormous amounts of aggregate being used for portland cement and bituminous concrete, suitable deposits of sand and gravel are becoming difficult to find. It is therefore becoming necessary to exploit less desirable deposits by separating the unsatisfactory particles from the sound ones. The Bureau of Reclamation states: "Specific gravity is a useful quick indicator of suitability of an aggregate; low specific gravity frequently indicates porous, weak and absorptive material, and high specific gravity often indicates good qual-

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ity." An efficient method of separating material of high from that of low-specific gravity, is the sink-float or "Heavy-Media Separation" process, used in the mining industry since 1936. It is similar to the ordinary method of hydraulic separation of different sizes of commercial sand, except that instead of using water and depending on size to effect a separation, media of greater apparent specific gravity—heavy media—are used, and the difference in specific gravity is employed to effect separation. The medium is a suspension of some finely ground material, usually ferro-silicon or magnetite, in water. The process is able to make sharp separations at any predetermined specific gravity ranging from 1.25 to 3.40, maintaining this within ± 0.01. The costs range from 8 to 50 cents per ton, depending on size of plant.

James F. Lynch, Jr.—"Poor Aggregate Deposits Made Usable by Sink-Float Refining Process;" *Civil Engineering,* December.

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County Aids in Planning of Town Highway Improvements. By *James W. Spencer,* Hway Research Eng'r., Cornell Univ. December, Pp. 26-27, 38.

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Photogrammetry: Aerial Photos Speed Up Highway Location and Design. By *L. L. Funk,* Asst. Dist. Engr. November-December, Pp. 24-29, 35.

Gaviota Pass Tunnel to Provide 4-Lane Highway. By *J. E. Eckhardt,* Design Engr. November-December, Pp. 36-37.

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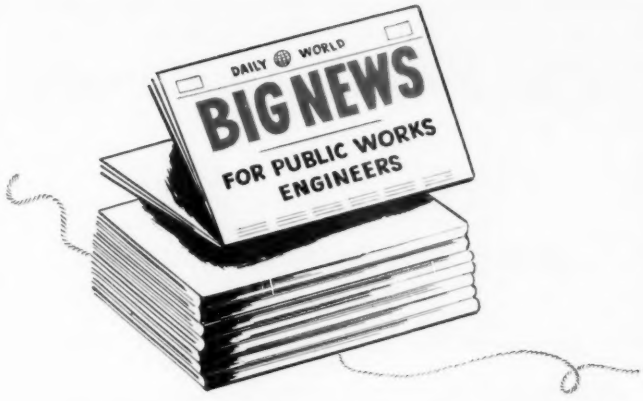

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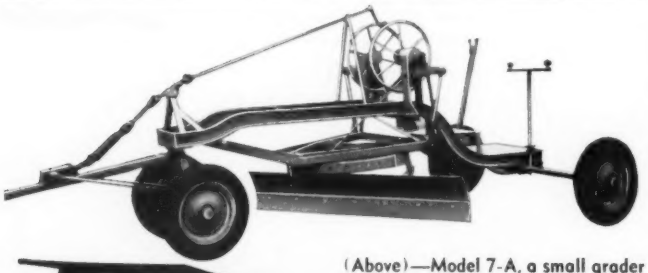

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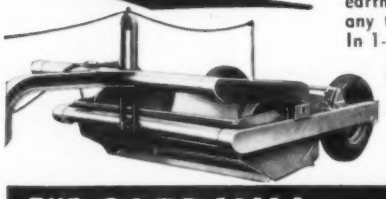

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Building the Superstructure for Chesapeake Bay Bridge. January, Pp. 18-19, 23-25.
Roadsides, Median Get Cover of Green. January, Pp. 27-29.
Hot-Mix Carpet Coat Seals County Roads. By *Harold Sprenger*, Orange Co., Calif. Road Com'r. January, Pp. 79-80.

Public Works

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Equipment Use Results in Greater Speed, Higher Efficiency and Lower Costs. By *E. L. Schmidt*, Dep. Sec. of H'ways, Penn. January, Pp. 39-40.
Conserving Critical Materials in Construction of Concrete Street Pavements. January, Pp. 44-45.
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• • •

Automatic Asphalt Binder Batcher

Tests have been carried out to determine the accuracy of a small semi-automatic volumetric binder batcher designed at the Road Research Laboratory, Harmondsworth, England, for use on bituminous mixing plants. The device was designed for a plant mixing 2-cwt batches and having a maximum capacity of $5\frac{3}{4}$ gallons. The device consists of a cylinder fitted with a piston, the stroke of which can be adjusted to give the required displacement volume. For these tests a succession of batches was drawn off as required from a tank containing hot tar into a separate vessel for independent check by weighing. It has been found that: (1) With the binder at a constant temperature, batches varying less than ± 0.3 per cent from the average batch weight could be obtained. (2) If the temperature of the binder varied within $\pm 5°C$. the variation in batch weights would be within ± 0.6 per cent. (3) The accuracy of setting of the mean batch weight depended on the accuracy of the estimate of the specific gravity of the binder at the working temperature and not on the operator's skill. The tests were reported by W. L. Russell in Roads & Road Construction and summarized in Road Abstracts.

Forecast: Snow

(*Continued from page* 57)

can be covered within two hours, and repeated again and again as long as the storm lasts.

Plows operate usually in teams of two or three, with the second behind and to the side of the first and the third offset from the second. They proceed in the direction of traffic and plow from the center to the sides of the streets. The plows are set at a slight angle and rest lightly on the ground except when the depth is too great to be removed in one pass. In this case the plows operate in tandem with the blade of the first raised to move the top half and the second lowered to remove the bottom half of the snow. Plows are raised or lowered hydraulically and are equipped with spring release mechanisms which permit tilting and riding over obstructions such as protruding manhole frames. Crosswalk plows are assigned to keeping crosswalks, intersections and bus stops clear. They are augmented at these locations by small gangs of laborers using pan scrapers and shovels and who also keep catch basin inlets open.

Snow Disposal

During the storm or shortly after its cessation, the problem of the disposal of snow arises. The methods used consist of sewering, scattering, flushing, piling and hauling, and waterfront disposal.

Wherever possible, snow is disposed of by depositing it into the city sewers as this is the most rapid and economical method of disposal. However, many of the sewers do not have sufficient flow in them to carry away the snow and others are so small that they would be easily choked. For this reason careful investigation is made during the year to ascertain which sewers can be utilized and the lists are posted in the various garages and district stations. Snow is fed into the manholes at rates to prevent clogging and where necessary flow is augmented from hose lines.

Scattering is the redistribution of snow which has been pushed aside by plowing, either into windrows or piles. It is moved back into the open traffic lanes where the churning action and temperature get rid of it. This operation can be conducted only at such times as the weather predictions indicate temperatures above freezing, a condition which often prevails towards the end of the winter season. Care must be taken to avoid creating traffic hazards in this operation.

Flushing has been sharply restricted due to the water shortage. This method had been employed in clearing streets of ice and snow when above-freezing temperatures prevailed. Gangs with hose and nozzles using hydrant pressure effectively cleared the streets.

Piling is resorted to when temperatures continue below freezing and the volume of snow precludes disposal by the methods mentioned above. Piles are made as large as possible and are placed on both sides of the street but not directly opposite each other. This procedure is not a complete disposal operation but serves only to store the snow for future handling. As mentioned above, when the temperatures rise above freezing, it is possible to distribute all the piles by scattering or in some cases by sewering. However, if the temperature does not rise and the snow must be removed, hauling is resorted to. Hauling is done both by department equipment augmented by hired trucks or by contract equipment which is arranged for before the snow season. Snow is loaded into trucks by de-

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partment blowers or conveyors or by loading equipment hired from the contractors. It is carried to the disposal points, which are either waterfront disposal locations along the shorelines of the city or at sewering points on sewers large enough to take truck loads. In some cases snow is dumped in vacant areas.

Parked and disabled cars are a great hindrance to snow removal, preventing full street width plowing, interfering with hauling operations and narrowing traffic lanes. Motorists will venture forth in spite of warnings to the contrary. In many cases, the cars are not mechanically sound nor equipped with tire chains; they have worn-out tires, rundown batteries or defective brakes. They become disabled quickly and block traffic. The Department uses its wreckers in addition to its snow equipment to move these vehicles.

Snow removal seems to have a peculiar attraction for many a harebrained inventor and more bizarre schemes have been presented for doing away with snow than for almost any other phase of municipal operation.. As a rule these geniuses have no conception of the enormous amount of heat required to melt snow as most of the devices consist of combining a snow loader and an incinerator—and, presto, snow problems are solved. However, quite a number of recently constructed skyscrapers, department stores and bus terminals have incorporated radiant heating systems in their sidewalks. This method consists of burying wrought iron pipe coils in the pavement and circulating hot water through them. The installation is rather expensive, but the operating cost is low. It is an effective way of getting rid of snow but has a rather limited field because of the high expense involved.

The annual fall averages about 32 inches in New York City. The greatest depth was encountered in the storm of 1947 when 27 inches fell on December 26-27. Old timers usually refer to the blizzard of '88 as "the worst storm the city has ever experienced", contending that no high winds accompanied the '47 storm which disqualified it from being designated as a blizzard. However, both storms caused a great deal of havoc, crippling most facilities.

The cost of snow removal is dependent on many factors such as depths, temperature and the time of the year. The annual cost for five years is tabulated below:

Year	*Inches*	*Storms*	*Expenditures*
1945-46	26.6	7	$ 2,172,000
1946-47	33.2	9	4,214,000
1947-48	61.5	9	11,780,000
1948-49	43.0	5	5,049,000
1949-50	10.4	7	1,931,000

Practically the entire personnel of the Department of Sanitation under Andrew W. Mulrain, Commissioner, is diverted to snow activities during severe storms. Overall direction and coordination stem from the office of the Director of Operations to the various subdivisions. The major portion of the work falls upon the Bureau of Street Cleaning and Waste Collection headed by P. Anzalone and his assistant, Joseph Hayden, Chief of Staff, for it has both the men and equipment to do the major portion of the job. The city has been divided into 8 borough commands, 57 districts and 234 sections for the primary purpose of waste collection and street cleaning. Superimposed on this structure is the organization for snow removal. The Snow Office, headed by S. K. Basil, is the center

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of preparations throughout the year and is a beehive of activity for 24 hours a day 7 days a week throughout the snow season. Watch is kept of all storms and developments. Orders relating to steps to be taken are dispatched by phone, teletype and radio.

Equipment is maintained, repaired, specified and requisitioned by the Bureau of Motor Equipment headed by E. A. Donnelly. The facilities and personnel of the huge Central Motor Repair Shop and the garage shops are concentrated on keeping snow fighting equipment in continual service. The Commissioner's staff section of engineering, headed by C. A. Rogus, collaborates on design and specifications.

The enormous amount of necessary accounting work required by snow removal operations, requiring sixty-five separate forms, is divided between the Snow Office and the Division of Administration headed by Harry Serper, Deputy Commissioner of Sanitation.

• • •

Heating Cable for Melting Snow on Roads

Four concrete runways, each 10 ft. wide and 100 to 275 ft. long, serve the South Milwaukee plant of Bucyrus-Erie Co. To keep these free from ice and snow, GE heating cable were laid on 3-inch centers on wire mats about 3 ins. below the surface of the pavement. Tile drains were installed along the edges to carry off the melted snow. About 40,000 ft. of cable were required. Results were very good. Even with the temperature 11° below zero, the runways were kept clear.

• • •

Michigan Maintenance Equipment

(*Continued from page* 63)

cated at the rear of these special sign erection trucks. This platform enables a man to operate the hammer or install a sign at any height up to 18 feet. The pressure for the operation of the platform hoist is also derived from the air compressor. This post driving equipment may also be operated from a one-ton pickup, a smaller compressor (45 cfm.) being used. In this case no platform is used and the hammer is operated from the ground, the air triggers being controlled with hand lines. As an example of the economy possible with this equipment, we have realized a saving of approximately 50 percent in labor charges on a test section. For the test we installed 8500 steel sign posts on US-16 between Detroit and Muskegon and in addition to the savings in money, the job was completed much faster thereby releasing the crew for other work.

We have tried to bring to the reader a better insight on the new trends in road maintenance as the picture has developed in Michigan. We are satisfied that great strides in economy, safety, and efficiency have been accomplished. At the same time we recognize that much remains to be done, and our programs of experimentation and development will continue. Aided by a more adequate tax structure, approved by recent Legislative Act, the Michigan State Highway Department as rapidly as possible is bringing the roadways of this state up to a standard which the public demands and to which they are entitled. Once again the very strength of a free world hinges on the production lines of Michigan. As a part of that production line our highways must be kept adequate. Our Maintenance Division intends to do their part.

Ferric Sulfate as Sludge Conditioner

At the sewage treatment plant of the Minneapolis-St. Paul Sanitary District, sludge from the settling tanks is pumped to concentration tanks where it is held approximately one day. Here the solids content increases from an average of 7.75% to 8.81%. After conditioning, the sludge is dewatered by means of a vacuum filter.

Ferric chloride has been generally regarded as the most effective coagulant for sludge in preparation for vacuum filtration, and has been the commonly used chemical for this purpose in most of the larger sewage plants. It was used in this plant for the first nine years of operation, but in June, 1947, it became necessary to change over to ferric sulfate (Ferri-Floc), no bids having been received on ferric chloride. This involved using a new chemical with entirely different handling and feeding characteristics, ferric sulfate being supplied in the dry granular form in bulk carloads while ferric chloride had been supplied in solution form in tank cars.

Fortunately this plant had been built to handle chemicals in either the dry or solution form, but economical sludge coagulation is a process which is very sensitive to changes in a number of factors, including the type of chemicals, the solution concentration, the point of addition to the sludge, and the method of mixing with the sludge. These factors had been well worked out with ferric chloride in the nine years of operation with that chemical, but remained to be solved for the new chemical, ferric sulfate. Considering this, together with the fact that ferric sulfate was regarded as inferior to ferric chloride as a sludge conditioner, it was to be expected that the chemical consumption, at least during the first several months of operation with the new chemical, would be considerably higher than had been experienced with ferric chloride.

For the first five months of 1947, during which the iron coagulant used was principally ferric chloride, the average dosage was 0.91% $FeCl_3$ and 2.53% CaO. For the last seven months of the year, when ferric sulfate was used, the average dosage was 1.52% ferric sulfate expressed in terms of ferric chloride for purpose of comparison, and 4.45% of CaO.

Ever since the regular use of ferric sulfate was begun in June, 1947, special endeavor has been made to improve the handling, feeding, dissolving, and mixing of this new chemical in order that it might more closely approach ferric chloride in effectiveness and economy. That these efforts have been successful is indicated by the records for the year 1949, when the dosage of ferric sulfate expressed as ferric chloride dropped to an average of 0.94% and the lime dosage dropped to an average of 2.95%; and for the year 1950 when these chemical dosages remained practically the same at 0.98% and 2.95%, respectively. This is even better than the record for the last five years when ferric chloride was in use, 1942 to 1946 inclusive, when the dosage averaged 1.10% $FeCl_3$ and 3.06% CaO. This is all the more gratifying when it is noted that in 1949 and 1950 the sludge was higher in chemical-consuming volatile organic matter, averaging 69.6% and 69.3% volatile solids compared with 65.2% for the 1942-46 period when ferric chloride was used.—From the 18th Report of the Minneapolis-St. Paul Sanitary District.

PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Influence of Detergents on Treatment

Due to their composition, as compared with soaps, the 5-day BOD of sewage liquor tends to be reduced in proportion to the amount of detergents present. The process of digestion in tanks is not affected by them but the volume of gas seems to be diminished. Synthetic detergents may cause violent frothing in those plants that employ mechanical types of activated sludge for secondary treatment. The presence of cationic types of detergents tends to inhibit or check bacterial growth. Data from Aurora, Ill., show reduced removals of suspended solids and BOD in the primary tank and increased loads passed to the secondary unit. Data from a number of cities indicate a definite upward trend in the use of detergents, especially in hard-water communities.

Walter A. Sperry—"Detergents and Their Influence on Sewage Treatment;" *Sewage and Industrial Wastes*, December.

Corrosion of Concrete Sewers by Hydrogen Sulfide

H_2S may be produced in sewers biologically from compounds containing organic sulfur formed from the hydrolysis of proteins effected under anaerobic conditions by a large number of species of proteolytic bacteria in sewage; or by the bacteriological reduction of sulfates to sulfides by the anaeorbic organism *Sporovibrio desulphuricans*. Sulfates are present in sewage almost entirely as inorganic sulfates and enter the system either as a soluble constituent of the water supply, in saline ground water infiltrating into the system, or in industrial wastes. Slimes and possibly silt deposits play a significant part in the generation of H_2S and their removal may be expected to reduce substantially H_2S conditions in sewers. Some experiences, however, indicate that some H_2S generation can occur where slime or silt deposits are definitely absent.

There are three separate parts of the problem—H_2S generation, emission and oxidation. The factors influencing the rate of emission include: 1—the concentration of undissociated hydrogen sulfide in the sewage film at the surface, which in turn is determined by the total sulfide content, the pH, and the presence or absence of heavy metal ions, such as iron, copper or zinc; 2—the thin laminar layers in sewage and the air adjoining the sewage-air interface. The thickness of the air film is particularly influenced by the relative velocity of the air to the sewage; 3—the presence or absence of floating and/or adsorbed surface films on the sewage surface. The fixation of the H_2S on the above-water walls of the sewer is followed by its conversion to sulfuric acid by bacterial action.

The author suggests several remedial measures for interrupting the complicated series of steps in the corrosion process. These include elimination of trade wastes containing sulfides; reduction of concentration of sulfates in sewage; partial purification of the sewage; dosage with chemicals to raise the oxidation-reduction potential of the sewage, as by adding nitrates or nitro compounds—probably impracticable; by aeration or chlorination; removal of slime or silt; reduction in detention and increase in velocity; reduction in turbulence; dosage with heavy metal salts or with alkalies; running the sewer full. The rate of H_2S fixation on the concrete may be reduced by ventilation; periodic wetting of the above-water walls of the sewer; use of resistant cement in the concrete; ammoniation of the sewer atmosphere; protective coatings of the walls.

C. D. Parker—"Mechanics of Corrosion of Concrete Sewers by Hydrogen Sulfide;" *Sewage and Industrial Wastes*, December.

Efficiencies During the Starting of a Trickling Filter

Rudolfs and others report that, when starting a trickling filter, "the building-up or working-in period required about three months." The authors believe that this referred to the period required for equilibrium conditions to manifest themselves, but that a considerable degree of purification should be obtained before equilibrium is reached. From experiments conducted at the Sanitary Research Laboratory of the University of Florida, the author found that equilibrium, as far as nitrification is concerned, takes considerably longer than for BOD reduction; that high filter efficiencies, as measured by BOD reduction, are obtained in a period of 7 days or less, whether new or previously used filter rock is employed, which should permit the use of trickling filters where treatment is required periodically. High efficiencies in BOD removal upon first starting a trickling filter are probably due to adsorption or other contact phenomena by the filter rock. Also, little or no lag is observed in the onset of the oxidation reaction of the adsorbed material. The nitrification reaction is more dependent upon "seed," temperature, and rock size than is the BOD reduction, but it follows the normal nitrification pattern as observed in stream recovery and elsewhere in nature.

G. R. Grantham and J. C. Seeger, Jr.—"Progress of Purification During the Starting of a Trickling Filter; *Sewage and Industrial Wastes*, December.

Sewage Service Charges For Industrial Wastes

A municipality, in determining a course of action with respect to the reception of industrial wastes into its system, may consider the following possibilities: 1—To exclude all or certain industrial wastes; 2—To require pretreatment at the source of all, or of certain wastes, to a

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O'Connor's Crew Setting Record In Laying Pipe Line
Claiming the world's record for a one-unit ditch digger, George W. O'Connor, head of the O'Connor Construction company which is currently digging and laying a gas pipe line from the Two-Dot gas wells to Warren, Montana, said that his crew had dug 17,200 feet of ditch last Thursday.
"As far as I know this is a world's record for a one-unit ditcher," said O'Connor, "and most ditch-men would call me a liar if I made this statement to them." O'Connor said that his crew had ideal soil for ditching last Thursday on the bench of Elk Basin. He said that he had working for him, Fagin Rehm, whom he described as the best ditcher operator in the area. Rehm's home is in Burley, Idaho.
The O'Connor Construction company of Fromberg, Montana, has a Cleveland ditcher powered by a diesel International Harvester company UD-9. The company's crew is still laying six-inch pipe. The last 18 miles of the pipe line to Warren will be eight-inch pipe. O'Connor said that his crew had omitted
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level approaching the constituents in normal domestic sewage; 3—To receive all wastes, or all except those which are not amenable to treatment or would cause real difficulties in the operation of the system. With either 1 or 2, the costs and administrative difficulties are likely to be much greater.

Among the charging methods used by the 12,000 communities having sewerage facilities are: 1—The ad valorem tax on property; 2—Special assessments; 3—Sewage service charges; 4—Special negotiated contracts with industry; 5—Combinations of two or more of the above. Most of the methods employed for determining charges for the handling of industrial wastes place too great a burden on property on the one hand or users on the other and therefore result in unfairness to certain classes. The procedure recommended by the Joint Group of A.S.C.E. and American Bar Ass'n. (see Sewerage Digest for January) presents a method of achieving fairness in the allocation of costs between users and properties in proportion to the use of, and the benefits received from, the sewage works. The more general adoption of this method, admittedly not as yet adequately tested in all procedural details, will result in improvements in its application.

George J. Schroepfer—"Determination of Fair Sewage Service Charges for Industrial Wastes;" *Sewage and Industrial Wastes*, December.

Sedimentation and Flocculation Equipment

Within recent years there has been a definite trend toward the integration of mixing, flocculation and clarification, in the treatment of industrial wastes, into a single compact unit. These high-rate units can be divided into two basic classifications. One is the so-called sludge blanket unit, in which the chemicals are mixed in a central compartment from which they pass downward and percolate upward through a suspension of precipitated solids, or sludge blanket. The other type utilizes mixing in a primary zone; transfer of this mixture of incoming wastes, chemicals and previously formed precipitates upward by means of a low-lift impeller to a secondary flocculation zone, discharge from this zone as a downwardly moving slurry in such a manner that the clarified liquor is squeezed out of the moving slurry,

which is returned to the primary mixing zone to serve as nuclei for the precipitation of new solids. The detention time of such units will vary with the particular wastes involved, but will normally range between 1 hr. and 4 hr., this time including mixing, flocculation and clarification, as compared to 2 to 6 hr. for systems involving separate units. In many cases, special treatment must be provided prior to the flocculation and clarification unit, such as the reduction of chrome wastes and oxidation of cyanides.

J. H. Bass and R. R. Evans—"Sedimentation and Flocculation Equipment for Treatment of Industrial Wastes;" *Sewage and Industrial Wastes*, December.

Treating Board Mill Waste

The River Raisin Paper Co. operates at Monroe, Mich. three paperboard machines producing approximately 350 tons per day and a strawboard machine producing 55 tons. After investigating for several years methods of reducing the volume of waste and treating it, a system was adopted with capacity to handle the wastes from the two largest machines. This included eliminating all roof water and clear waste water from the mill sewers; arrangement to re-use machine water wherever practicable; and provision for ultimate disposal of the mill wastes in a sedimentation unit of suitable capacity and design. The unit for clarification of the final mill effluent is a "Cyclator" allowing 100 min. detention at full capacity, with alum and activated silicate as coagulants. This plant has demonstrated that the re-use of white waste to reduce the total volume of mill effluent is practicable. The economics of the system do not present such an attractive picture if the final sedimentation unit is made to stand alone, but are not too discouraging if the economics effected by recirculation of water are considered.

M. F. Knack—"Treatment of Board Mill Waste at River Raisin Paper Company, Monroe, Mich.;" *Sewage and Industrial Wastes*, December.

Treatment of Cannery Wastes

Several plants are operated by Stokely Foods, Inc., and in disposal of the wastes, no one treatment method has been found that is ideal for all. Some discharge to municipal treatment plants; other methods are lagooning, with chemical stabilization; soil absorption, or anaerobic digestion. In lagooning, sodium nitrate usually is added to accelerate stabilization and minimize odor. Satisfactory results are obtained by use of 150 lb. of nitrate per 1,000 cases of peas, and 200 lb. per 1,000 cases of corn or tomatoes. Soil absorption differs from the lagoon method in that the liquid is absorbed into the soil; used where the soil is suitable. Anaerobic digestion was tried in 1950 in full scale operation at two plants. The theory is to hold the raw liquid waste in intimate contact with suspended solids which have the ability to accelerate decomposition. Usually it is carried on at elevated temperatures in inclosed digestion units, but for economy an open pond 80 x 270 ft. and 7 ft. deep was used. Four quick mixers mounted on rafts on the pond agitated the wastes and seed sludge from a municipal sewage treatment plant. From the digester the waste overflowed to a storage lagoon. So far as abating stream pollution is concerned, the method was satisfactory and without objectionable odor. The cost was $6.18

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per 1,000 cases of No. 2 cans of corn, including power consumed by mixers and amortization. The chemical precipitation method is now considered less than 50% effective.

C. W. Templeton—"Cannery Waste Treatment and Disposal;" *Sewage and Industrial Wastes*, December.

Sewage Tests for Small Plants

At sewage plants where the operator has had little or no chemical training, which is the case with many small plants, tests can be made for settleable solids, relative stability, dissolved oxygen, pH value, and residual chlorine. The dissolved oxygen test is rather difficult and hence frequently is not applied in the smaller plants. The equipment necessary for these tests includes: for settleable solids, 3 Imhoff cones and a stand for same; for relative stability, 12 8-oz. bottles and 2 pipettes; for dissolved oxygen, 2 8-oz. bottles, 2 pipettes, 1 Erlenmeyer flask, 1 50-ml burette and a burette support; for pH value, a comparator; for residual chlorine, a 500 ml Erlenmeyer flask, a 50-ml burette, 2 Nessler tubes; for jar tests, 6 2-liter beakers and a stirring device; also, for general purposes, 2 400 ml beakers, 2 thermometers, 2 short-stem funnels, 2 long-stem funnels, a ring stand and 2 rings with clamp. The total approximate cost is $112. For large plants, the author lists about 330 items costing $708.74.

Clarence R. Holden and Quintin B. Graves—"Laboratory Equipment and Supplies for Sewage Testing;" *Water & Sewage Works*, December.

Trickling Filter 35 Feet Deep

For handling the sewage from a tourist lodge and cabins in Cumberland Falls State Park, Ky., an Imhoff tank, trickling filter and sludge drying beds have been constructed, designed for an average flow of 15 gpm and maximum of 75 gpm. A load of 35 lb. of BOD per day is expected. A novel feature is the depth of the trickling filter. There is a 35-ft. vertical cliff between the plant and the river receiving the effluent, and the filter is built against this cliff, resting on the ground at its base. It is of standard silo construction, 14 ft. in diameter, using concrete tongue-and-groove vertical staves, 2-in. spaces being left between the ends of the staves; tied together with steel hoops. The openings afford ventilation, and suggest the possibility of studying the condition and operation of the filter at various depths.

"Filter Oddity Is 35 Feet Deep;" *Engineering News-Record*, December 20.

Intermittent Chemical Treatment

Since 1939 Wooster, Ohio, has been operating a treatment plant which flocculates and settles the sewage and provides post-chlorination; this primary treatment being considered sufficient during a large part of the year. However, chemical precipitation has been provided for and used during periods when the receiving stream could not satisfactorily assimilate the effluent from plain sedimentation. A value of 5 ppm of D.O. at the effluent discharge point has been established as a minimum. For several years it has been possible to maintain a DO above 5 by the use of chlorine when otherwise chemicals probably would have been required. No chemicals were used during the years 1943, 1947, 1948 and 1950. The chemicals used

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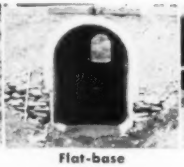
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are doses of 1 grain of ferric chloride and 10 grains of calcium oxide per gallon. Records show an increase from 65.1% to 83.2% in reduction of suspended solids by the use of chemicals, and an increase in BOD reduction from 39.8% to 62.0%. It is standard practice to discontinue dosage of chemicals (but not of chlorine) between 11 P.M. and 7 A.M.

Ward E. Conrad — "Chemical Treatment of Sewage for Short Periods;" *Sewage and Industrial Wastes*, November.

Treating Milk Wastes By Activated Sludge

Experience of one to 15 years with five plants treating milk wastes by the activated sludge method indicates clearly that such treatment is entirely practicable and can be made extremely simple, and that the operation of it can be reduced to seeing that the blower and pump are kept operating and the diffuser media are kept clean. The advantage of having an aerated holding tank to equalize the flow through the aeration and settling tank and to composit the wastes from the dairy is very marked. The idea of disposing of all milk solids by means of aerobic action has been proven practicable. There remains the problem of working out the most economical designs.

Paul M. Thayer — "Activated Sludge Treatment of Milk Wastes;" *Sewage and Industrial Wastes*, December.

Ventilating Sewage Plants

The author, a consulting ventilation supervisor, found in many of the sewage treatment plants which he visited, hazards attendant on lack of adequate well-designed ventilation in the potential danger spots. That there are not more explosions or other accidents due to gases would seem to indicate a special dispension of Providence in favor of such plants, which he likened to time bombs. Among the hazards he noticed was an open gas burner in a screen room within a few feet of the open sewer (which might at any time receive discharges of gasoline, naphtha or other inflammable liquid). In a plant where a boiler was heated by sludge gas, the controls allowed the gas valve to be opened when the pilot light was off and operators had been singed when lighting the boiler. Some faults

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in attempted ventilation are due to the belief that methane and certain other gases which are lighter than air can be removed by ventilators at the top of a room, and that gasoline vapors, being heavier than air, will remain near floor level and ventilation there provides safety. As a matter of fact, mixtures of these gases in explosive proportions have vapor densities of approximately 1.0 and can be carried up or down by slight air currents. Another fault is providing fans for removing air from enclosed rooms, wells, etc. without also providing for the entrance of air to replace that removed, the entrance of such replacing air being so located as to sweep the polluted air ahead of it to the outlet, or at least to dilute all of it. He quoted recommendations of the Division of Industrial Safety of California relative to ventilating sewers and sewage plants.

K. E. Robinson—"Ventilation of Sewage Plants;" *Sewage and Industrial Wastes*, November.

Solving a Milk Waste Disposal Problem

Sabetha, Kansas, population 2400, provided an excellent location for a creamery, being in the center of a dairy country. The only outlets for its sewage were two small streams, and it was treated in a plant consisting of an Imhoff tank, trickling filters and final settling tank. This plant received the wastes from the creamery, which by 1947 had so increased in amount that they practically equaled the entire domestic sewage and overloaded the plant. In 1949 a consulting engineer recommended, the State Board of Health concurring, that the milk wastes be given pretreatment by the creamery and be discharged into the municipal sewers at a constant 24-hour rate. The creamery did not approve of this plan and instead proposed to reimburse the city for part of the treatment costs if a second plant were built nearer the creamery. They claimed that pretreatment for the wastes at the plant would cause odors that would affect the quality of the plant's products. An agreement was finally reached by which the creamery would pay the city $85,000 to help build a new plant to be owned and operated by the city. (The plant was built for $123,872.) It was estimated that the creamery would contribute 67,500 gpd, with an oxygen demand of 765 lb., and the domestic sewage would be 75,000 gpd with an oxygen demand of 255 lb. The discharge of creamery wastes is not to exceed a rate of 9,000 gph. The sewage is preaerated for 30 min. There are three settling basins and two trickling filters, and by means of baffles in the channels the sewage can be routed through them in any order desired, or any of them can be bypassed. There is a digester with a capacity of 2.9 cu. ft. per equivalent population, equipped with external heat exchanger and insulated with asphalt-enclosed preformed fiberglass. The BOD of the final effluent is expected to be less than 40 ppm.

Dwight Metzler—"Industry and City Cooperate in Sewage Treatment;" *PUBLIC WORKS*, January.

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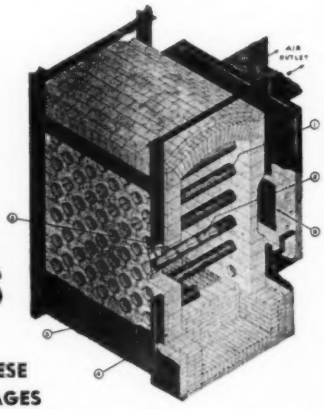

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How to Finance Sewage Disposal (Panel discussion of report digested in the January *Sewerage Digest*, "Fundamentals in Rate Making") by *Francis S. Friel, Samuel A. Greeley, Thomas M. Niles, George J. Schroepfer, George P. Steinmetz,* and *Edward J. Cleary.* Dec. 27, Pp. 29-32.

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Industry and City Cooperate in Sewage Treatment. By *Dwight Metzler,* Chf. Engr., Div. of Sanitation, Kansas Bd. of Health. January, Pp. 46-47, 82.

Application of the NRC Filter Efficiency Formula By *B. N. Walton, Jr.,* San. Engr., Texas Dept. of Health. January, Pp. 50-52.

Pre-Treatment of Milk Wastes Reduces Treatment Plant Load. By *Philip S. Davy,* Cons. Engr. January, P. 56.

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Detergents and Their Influence on Sewage Treatment. By *Walter A. Sperry,* Supt. Aurora, Ill., Sanitary Dist. December, Pp. 1469-1476.

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Activated Sludge Treatment of Milk Wastes. By *Paul M. Thayer,* Dist. Mgr. Chicago Pump Co. December, Pp. 1537-1539.

Cannery Waste Treatment and Disposal. By *C. W. Templeton,* Asst. Chief Engr., Stokely Foods, Inc. December, Pp. 1540-1545.

Effect of Certain Environmental Factors on the Biochemical Oxidation of Wastes. By *H. Heukelekian* and *I. Gellman,* N. J. Agri. Exp. Sta. December, Pp. 1546-1563.

Winter Maintenance. By *D. L. McLean,* Supt., Greater Winnipeg San. Dist. December Pp. 1565-1567.

Effects of Chemical Industry Wastes—Niagara Falls, N. Y., Sewage Treatment Plant. By *Edward J. Smith,* Supt. Sewage Treat. Plant. December, Pp. 1567-1571.

Phenol Wastes Upset Digesters at Hartford, Conn. By *George Lebethin,* Chemist, Sew. Treat. Plant. December, Pp. 1573-1574.

South African Municipal Magazine

Biological Filtration Processes for Settled Sewage. By *L. F. de Vaal,* City Engineer, and *H. M. de Vaal,* Chf. Chemist, Pretoria. November, Pp. 11, 13, 15, 21.

Deflection Tests on Concrete Pipes. November, Pp. 19, 21.

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Tank Car Wastes Treated by Chemi-Adsorption. By *Gregoire Gutzeit* and *Glenn Enyart.* January, Pp. 18-22, 43.

Operation of Dosing Chambers and Trickling Filters. By *J. T. Sprague,* City Engr., Miami, Okla. January, Pp. 23-24.

How to Be Safe While Maintaining Sewers. By *E. W. Brown,* Sewer Maint. Div., Los Angeles, Calif. January, Pp. 29-32.

Effect of Ground Garbage on Sewers and Sewage Treatment. By *R. W. Simpson,* Cons. Engr. January, Pp. 33-34.

Water and Sewage Works

Waste Savings Accomplished by American Maize Products Co. By *E. M. Van Patten,* Bacteriologist, and *G. H. McIntosh,* Chemist. December, Pp. 516-523.

Laboratory Equipment and Supplies for Sewage Testing. By *Clarence R. Holden* and *Quintin B. Graves,* Oklahoma A & M College. December, Pp. 524-527.

Underground Water Contamination by Chromium Wastes. By *Herbert W. Davids,* Asst. Pub. Health Engr. and *Maxim Lieber,* Sr. San. Chemist, Nassau County Dept. of Health. December, Pp. 528-534.

How to Make Garbage Disposal Pay

By going into the garbage disposal business in 1951, city council members at Michigan City, Ind., have shaved several thousands of dollars off the city budget and have developed probable additional sources of city revenue in years to come. Last year Michigan City paid a private contractor $20,000 to collect garbage and spent another $10,000 for "rent" on a dumping area. But this year the council bought an International TD - 14A crawler tractor equipped with a two-yard Drott bullclam shovel and two used trucks. Without much difficulty, they found a landowner who was delighted to have his marshy property filled by the city without cost to him.

Based on the results for the first nine months of 1951, the City expects to finish out the year with a neat savings in the refuse department. And since the property being filled will soon be the site of an industrial building, the day may come when city taxes on this property will also contribute materially.

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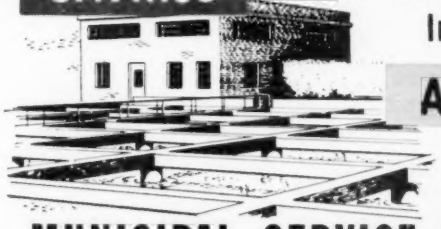

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Filter Stone and Underdrains

(*Continued from page* 54)

of placing 1 cu. yd. per minute was maintained. In all, 96,000 tons of stone or about 78,000 cubic yards were placed. Final leveling of the stone to proper grade was done by means of a homemade drag harrow, (built by welding reinforcing rods to railroad rails) attached to a drag line.

The contractor was Russ Mitchell and Bruce Construction Company of Houston and Fort Worth, Texas. R. E. Josserand was Superintendent of construction. Plans and specifications were prepared by Freese and Nichols, Engineers, Fort Worth, Texas.

• • •

Machines and Men in Maintenance

(*Continued from page* 65)

widespread use. Costly machines designed for highly specialized work can perform their assigned tasks with a minimum of labor but the ownership of such machines is economical only when the work potential is relatively high. Few county highway departments have sufficient volume of work to justify the purchase of expensive specialized machines. The inclination, therefore, is to rely upon more general purpose equipment and adapt it as best they can to the work at hand

It was mentioned at the beginning of this discussion that there is only slight possibility of completely eliminating the use of hand labor methods in certain maintenance activities. While it is true that hand methods in the final placing of patch material may not be eliminated entirely, yet the processes of preparing and having available for use the necessary materials are susceptible to almost endless possibilities for mechanization. The extensive mileage of bituminous surfaced highways—the large portion of which is road-mix—makes it mandatory to have on hand adequate quantities of materials for patching. These consist chiefly of stockpiles of premixed bituminous patch material. The preparation, handling and loading is accomplished in a variety of ways among the various counties. The motor-grader is still the most widely used mixing device, but travel plants and small portable mixers of the pug-mill type are becoming more in evidence. The belt and bucket type loaders, along with

detachable front-end loaders for tractors, have helped to eliminate much of the back-breaking, hand-loading work required in order that the material be available for use when needed. Some engineers have stated that the trend is generally to higher types of hot-mixed bituminous surfacing. This is possibly true and perhaps desirable on the more heavily travelled routes, but there remains a considerable mileage of lightly travelled roads on farm to market routes and in resort areas. The voice of the public demanding "black top" surfacing for these insists upon being heard. Neither the traffic volume nor the structural condition of their roadbeds can justify high-types of surfacing. The so-called road-mix "skin mats" and "turnovers" have served the motorists on many miles of these routes economically and satisfactorily for almost a score of years. Present financing would appear to indicate that those or similar surfaces will need to serve for several years in the future. Further improvement and development of mechanized methods for construction and maintenance of these surfaces would appear to be economically sound.

Cement Concrete Maintenance

The removal and replacement of small sections of Portland cement concrete pavement, while a relatively minor item in the present maintenance program, has progressed considerably from hand labor methods to a fairly high degree of mechanization in some counties. Breaking the damaged sections into sizes that can be handled and removed with comparative ease has passed from the use of the bar and hand-thrown steel ball through the air drills and jack hammer method to a limited use of a machine designed especially for the purpose of breaking up concrete pavements. Similarly, there is a marked increase in the use of commercially produced transit-mixed concrete for use in replacing the small sections of slab removed. Cost figures are not available to indicate the dollar-saving value of this mechanization, but the speed with which the work is accomplished, not to mention the saving in inconvenience to traffic, would indicate the worthwhileness of the modern methods.

Mechanization of maintenance has been the subject for comment by many eminent highway engineers. Rex Whitton, formerly Chief Main-

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tenance Engineer of the Missouri Highway Department, and now Chief Highway Engineer for that state is one of the many exponents of modernization of maintenance methods. J. S. Bright, former Deputy Commissioner, U. S. Bureau of Public Roads, now retired, and H. A. Radzikowski, Chief, Division of Maintenance, U. S. Bureau of Public Roads, have spent much time in studying and analyzing the problem. All appear to reach the same conclusion: that further mechanization will provide the principal means of getting the most out of the maintenance dollar. It is further concluded that "Effective Equipment Management is the key to better and more economical highway maintenance."

• • •

Standby Engines

(*Continued from page* 71)

Engineers. A number of the pumping stations will have electric motor driven pumps but two will have a total of fourteen 500-hp. gasoline engines driving vertical pumps, each discharging 100 cfs. or 45,000 gpm. against a head of approximately 30 feet.

Other Installations

Wardens of penitentiaries and correctional institutions realize the danger of riots and insurrections during any period when the buildings and grounds are not illuminated. As a result, most of the federal institutions and many of the county and town jails have emergency gasoline engine driven generators.

Coal mines need emergency power to operate ventilating fans for the protection of the miners and to keep the mine in operation during power outages. If the air stops moving the miners start moving to the exits. One large company in the south has all of its mines equipped with standby engine driven fans which start automatically when normal power fails. One 500 hp. engine driven fan pulls approximately one million cubic feet of air per minute through the mine. This same company is installing two 600 hp. gasoline engine driven pumps to protect its water supply.

A turkey farm in Iowa has over $10,000 invested in a standby engine driven generator. The owner advises that it would be impossible to operate without this protection against current stoppage.

Public Works EQUIPMENT NEWS

Portable Gas Engine Driven Generators

Suitable for many power requirements three portable gas-engine driven electric generators, made in 1000, 1250 and 1500 watts, 115 volts, 60 cycles, AC. Drive is by belt. They can be used for civil defense, flood lighting, emergency repair, in case of power failure, for portable power tools and for operating short wave radio. Data from Wincharger Corp., Sioux City, Ia., or by using the coupon.

Use coupon on page 32; circle No. 2-1

The AD-40 and AD-30 Motor Graders by A-C

Two completely new motor graders have been announced by Allis-Chalmers. The 4-cylinder, 2-cycle, diesel AD-40 weighs 23,000 pounds and develops 104 bhp. The 3-cylinder, 2-cycle diesel AD-30 weighs 22,700 pounds and develops 78 bhp. Tandem drive provides full traction under any ground conditions. Accessibility for service or repair, of all important parts, is an important feature. Easier shifting, complete visibility, hydraulic steering and operator comfort are among the features. Data from Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wisc., or use the coupon.

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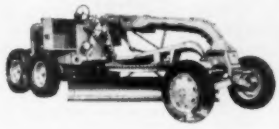

New Model AD-40 grader.

3 to 6½-Yard Ready-Mix Unit with Special Features

The Jaeger Model HMD truck mixer or agitator is made in 3, 4½ and 6½-yd. sizes. Basic in all units is the dual-mix action to which additional equipment may be added, as determined by service requirements, including: Open-type end loader for minimum machine weight; end loader with special seal; devices for wet-mix agitator service. Data from Jaeger Machine Co., Columbus, O., or use the coupon.

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6½-yd. mixer in operation.

Chemical Soil Conditioner Improves Soil Structure

Krilium is a synthetic polyelectrolyte which is said to be many hundred times more effective than compost manures or peat moss in improving soil structure. It should be effective in erosion control problems created by construction, and for highway roadsides. It will not be available in substantial quantities until 1953. Data from Monsanto Chemical Co., St. Louis 4, Mo., or use the coupon.

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Ready for all repair jobs.

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In the medium class size, these new motor graders have 40 hp engines, weigh up to 15,000 pounds and carry 10-ft. or 12-ft. bladers. They are designed to fill the gap between the light and the heavy-duty graders. A selection of special features is available: single or tandem drive; gasoline or diesel engine; front-end loader; scarifier; blade side shift, power circle turn, and tire sizes. Mechanical features include hydraulic control. 5 forward speeds and one reverse. Data from Meili-Blumberg Corp., New Holstein, Wisc., or use the coupon.

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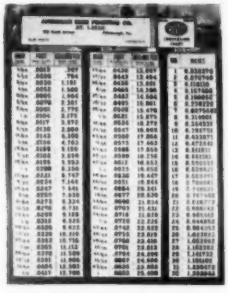
New Meili-Blumberg grader.



Handy conversion chart.

Metric Equivalents in Wall Chart Form

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Flexible Guide for Traffic Line Marker

A flexible paint guide permits this traffic line marker to follow the contour of the pavement surface for marking danger zones, traffic lanes, cross walks and parking stalls. The lining machine itself is said to be able to put down 10,000 ft. of line per hour and to paint any width line from 2 to 6 ins. Data from Universal Mfg. & Sales Co., 8716 Santa Fe Ave., South Gate, Calif., or use the coupon.

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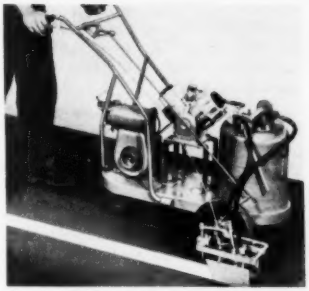

Laying down the line.

Glass Blocks for Light Control in Critical Areas

Weighing one-third less than an 8-inch concrete building block, these new 12-inch Pittsburgh Corning glass blocks provide 12½% more wall space, have better insulating value, take less floor space and require no costly finishing. They are available in three styles. Two are light-directing and one is light-diffusing. Data from Pittsburgh Corning Corp., 307 Fourth Ave., Pittsburgh, Pa., or by using the coupon.

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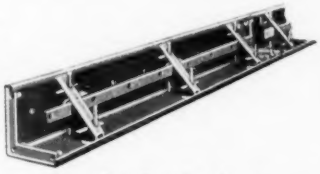
Heavy-Duty Airport Paving Form

Heavy duty paving forms, especially for airport paving, are available in sizes above 12 ins. and can be furnished in any height required. The width of the base is equal to the height. The end of each 10-ft. section is reinforced. Construction is of ¼-in. steel plate. The self-aligning feature insures that, once in place on the prepared subgrade, no movement will occur during staking and wedging. The steel pins connecting the sections cannot fall out. All details from Blaw-Knox Division, Farmers Bank Bldg., Pittsburgh, Pa., or use the coupon.

Use coupon on page 32; circle No. 2 - 13



Heavy-duty form for airports.

Vibro-Tamping Gives Better Subbase Compaction

With the Vibro-Tamper, it is claimed that continuous one-course subbase construction is possible with 15 ins. of loose aggregate, and that this can be compacted to 10½ ins., with a 95% Proctor density. The tamper will cover a strip 12½ ft. wide. Rate of travel is 16 to 45 fpm, depending on course thickness and material; and as much as 3,000 sq. yds. per hour per pass has been compacted. The compaction effect

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The NETCO CATCH BASIN CLEANER with pneumatic controls

Easily mounted on any short wheel base truck with 8 ft. in back of the cab, the *Netco* can be operated continuously, averaging 20 to 30 catch basins a day. The *Netco* with its two powerful pneumatic buckets (orange peel or clamshell) is simple to operate, has a hoisting capacity up to 1500 lbs., and easily removes all debris through openings as small as 16 inches.

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All Controls at Working End — keeps operator out of passing traffic — allows full vision of work.

Built-in Gear Reduction Ratio — allows better use of engine for pulling power and bucket travel speed.

Fully Automatic Safety Clutch — instant acting — avoids damage to tiles and machines.

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Hammond, Indiana

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Champion Corporation, 4752 Sheffield Ave., Hammond, Indiana
Please send information on new OK Champion Power Sewer Cleaners.

Name.....Title.....

Address.....

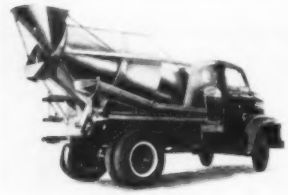
has been measured to a depth of 36 ins. More information from International Vibration Co., Cleveland, O., or by using the coupon.

Use coupon on page 32; circle No. 2 - 14

● ● ●

Two-Speed Mixing Provided in Truck Mixer

These mixer-agitators are designed to provide maximum payload at minimum rear axle weight, while retaining such features as catwalks, enclosed water tanks and fenders. The hinged discharge chute can be



3-yd. truck mixer.

handled easily by one man and is swung out of the way for transit. The use of a Ford power unit and transmission close-coupled to a modified Ford rear axle gearing assembly permits a high mixing speed for charging and a low speed for agitating. Write Construction Machinery Corp., Waterloo, Ia., or use the coupon.

Use coupon on page 32; circle No. 2 - 15

● ● ●

Cathodic Protection Installation for A Pipe Line

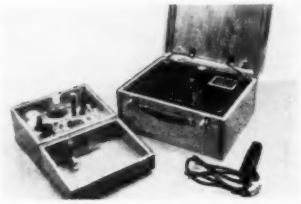
Cathodic protection has been provided for 2200 feet of underground pipe line at an Oklahoma City, Okla., industrial plant. Though the line was only 5 years old in 1950, a considerable percentage of the pipe had required replacement and much of the remainder had been patched. After cathodic protection was installed, only one leak occurred in the succeeding 12 months. You can get information on this installation, with details, from Harco Corp., 16974 Broadway, Cleveland, O., or by using the coupon.

Use coupon on page 32; circle No. 2 - 16

● ● ●

pH Meter Has Range from 0 to 14.15

This instrument is designed for pH and rH work, potentiometric titrations and oxidation-reduction



For the laboratory.

potential work. It provides a measuring accuracy of 0.01 pH or 0.5 mv, a range of 0 to 14.15 pH and 0 to 1415 mv, and currentless measuring with no phenomena of polarization. It can be used with glass, quinhydrone, hydrogen and platina electrodes and is direct calibrated for the first three. Data from North American Philips Co., Inc., 750 South Fulton Ave., Mount Vernon, N. Y., or use the coupon.

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neers, mainly hydraulic structures; and hydraulic engineers, for hydrologic and power investigations. A. J. Rizzo, Chief, Personnel Branch, District Engineer, Corps of Engineers, New York 13, N. Y.

A consultant irrigation engineer is needed in Brownsville, Texas, according to the Board of City Development there, which says: "An opportunity exists for a successful private practice for a top grade consulting irrigation engineer." You can get some interesting information about the possibilities and about Brownsville by writing to the Board.

• • •

Minnesota Highway Department Up To Date

Minnesota Highway Department makes extensive use of photography, maintaining a complete photographic laboratory to process all departmental roll films and those made by the Division of Materials and Research laboratory. Most divisions of the department have found this service useful for administrative purposes and for analysis and dissemination of information. Hours of work are saved through photographic reproduction processes. A vacuum-seal printer and use of the silk screen process permit better results and fast reproduction of multiple copies where color is essential. All irreplaceable records, plans and resolutions are microfilmed. Aerial photography is used in connection with road locations, gravel exploration and development of county and state maps. Movies are made of projects and for use in legal and traffic problems. Slides and color transparencies are produced in quantities. These assist both project engineers and instructors on extension courses in highway construction, but further than this they are useful in visual education in connection with highway safety, roadside development programs and other phases of the highway program.

Each year a state traffic flow map is produced which shows the annual daily traffic volumes on all parts of the Trunk Highway System. County traffic flow maps, showing annual daily traffic volumes on all roads in the county, are being produced on the basis of a five-year traffic counting program which was started in 1949. Maps for the initial 17 counties are near completion as the biennium ends.

Automatic traffic recorders are operated at 27 strategic locations on the trunk highway system.

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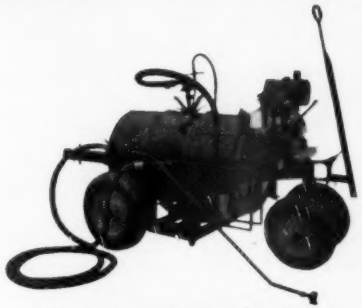

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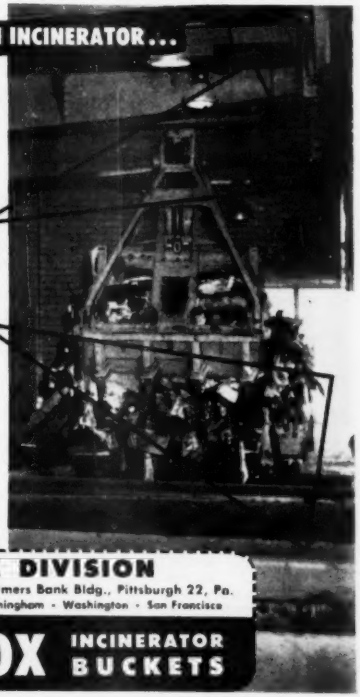

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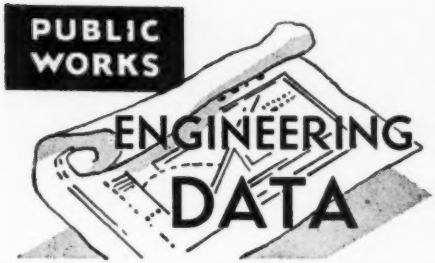

Cement Dust is a Useful By-Product

Cement dust from the operations of the Kingsport mills of Penn-Dixie Cement Co. no longer creates a nuisance in that city but has become a useful by-product of possible profitableness. Some 75 tons of this dust that formerly settled on the Kingsport landscape each day is now collected through the company's new installed wet process, and farmers of the region have been invited to help themselves to the dust for fertilizer use, says the *Kingsport Commentator*. University of Tennessee tests have shown the dust to be high in potash content and excellently suitable as a fertilizer for that region. The Kingsport plant of Penn-Dixie is the first in that company's chain of mills to utilize this by-product, although an Alabama cement manufacturer has successfully marketed a similar by-product to the South Carolina peach-growing areas. The Kingsport plant hopes eventually to market its dust by-product through a commercial fertilizer company. The program of atmospheric cleanup at Kingsport was described in Public Works, January, 1951.

Nowata Has First Fluoridation Installation in Oklahoma

City water for Nowata is taken from the Verdigris River. Treatment includes coagulation with alum, pH control with lime, and both pre-and-post-chlorination. Fluoride is fed with a Wallace & Tiernan Type NA fluoridator into the suction of the two supply pumps. One of these has 470 gpm capacity and the other 520 gpm. The fluoridator is syncronized for start-and-stop operation with these pumps. At present sodium silicofluoride is used, 6.24 ounces per hour being fed to the 470 gpm pump and 7.01 ounces per hour being fed to the 520 gpm pump, giving a fluoride dosage of about 1 ppm. The equipment is suitable for the feeding of sodium fluoride if the city should wish to change at a later time.

Radioactive Waste Problems

In the interests of public health and of convenience to users of isotopes, an AEC-supported project at Mount Sinai Hospital in New York is investigating the possible hazards of releasing radio-isotope wastes into public sewers. According to AEC, evidence indicates that hospitals disposing of radioactive iodine and phosphorus—the isotopes chiefly used in their research—cause no danger to sewage disposal workers because the volume and rate of flow dilutes the active material to a safe level.

Plumbing fixtures through which isotope wastes had passed were dismantled, tested, and found below any degree of radioactive contamination that might be hazardous to plumbers.

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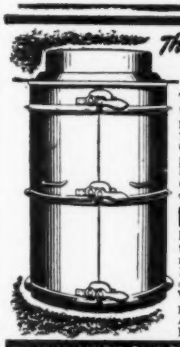

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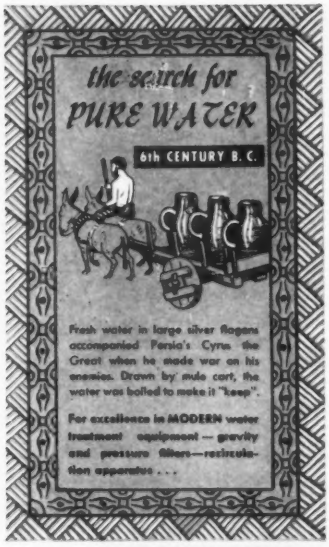
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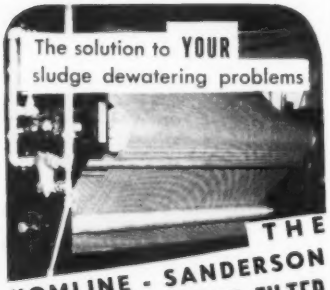

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Worth Telling

by Arthur K. Akers

★ **VISITING** with JOHN FORD by long distance telephone, we heard more about The FORD METER BOX COMPANY'S new super-modern and bigger plant at Wabash, Ind. John promises a picture of it for this page when a flier can again get off the winter ground to take it.

★ **TRACKSON COMPANY,** of Milwaukee, is now a wholly owned subsidiary of CATERPILLAR TRACTOR COMPANY. TRACKSON has two large Milwaukee plants and its products have been sold through CATERPILLAR dealers for the past 15 years.

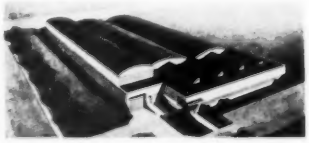
★ **L. E. HARPER,** president of Omega Machine Company, a B-I-F Industry, has moved east from Wilmette, Ill., to direct his company from Providence, R. I.

Mr. Harper

★ **GENERAL DONALD ARMSTRONG** has resigned as president of the United States Pipe and Foundry Company to take an important economic stabilization post in Europe. Former Chairman of the Board N. F. S. RUSSELL succeeds him as president. And HUBERT F. O'BRIEN, president of the A. P. SMITH MANUFACTURING COMPANY, East Orange, N. J., has been elected to the U. S. PIPE board.

★ **J. REID HOBSON** is chief of department—mechanical—for Knappen-Tippetts-McCarthy, consulting engineers, New York. He was previously chief engineer, Jamaica (L.I.) Water Supply Company.

★ Here is the new factory being built in Melrose Park, Ill., by YEOMANS BROTHERS COMPANY, makers of pumps and waste treatment equipment.



New Yeomans Bros. plant at Melrose Park, Ill., will soon be completed.

★ **CHICAGO BRIDGE & IRON COMPANY**—elevated steel tanks to you—announces Marvin G. Mitchell as manager of their Atlanta sales office. Also Fred L. Goldsby in their export department, New York.

Mr. Holt

Mr. Turner

★ **WE WELCOME** to this page E. H. HOLT, new general sales manager, and J. D. TURNER, director of publicity and promotion, of the BARBER-GREENE COMPANY, Aurora, Ill.

★ Other CATERPILLAR news includes T. R. FARLEY, a vice president, going to York, Pa. to direct expansion at the new parts plant there. WILLIAM L. NAUMANN succeeds Mr. Farley as general manager of the earth moving equipment plant, Joliet.

★ Out in the Northwest look for this face—that of GENE THOMAS, new district manager in that area for THE FRANK G. HOUGH COMPANY, Libertyville, Ill.

Mr. Thomas

★ **AMERICAN BITUMULS AND ASPHALT COMPANY,** San Francisco, announces election of C. W. TURNER as president, succeeding C. W. STEWART, now vice-chairman of the board.

★ **JOSEPH F. O'GRADY** is now sales manager of the ROCKWELL MANUFACTURING COMPANY'S water meter division, Pittsburgh.

★ **GLAUBER BRASS COMPANY,** Kinsman, Ohio, has let contracts for a huge new plant at Tyler, Texas, which will double their production of valves and plumbing brass goods.

★ **LAST LAUGH:** A dime is a dollar with the taxes removed.—*Sparling* METROGRAMS.

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Five capital cities under five different flags, but with one important factor in common . . . they all have major water supply lines built of Lock Joint Concrete Pressure Pipe.

• • •

This unanimity of choice can be attributed to the sound design, high quality of materials and excellent workmanship which goes into the production of Lock Joint Concrete Pressure Pipe. The ample steel reinforcing provides a rugged pipe which will withstand both high internal pressures and unusually heavy overburdens. Walls of carefully proportioned concrete prevent corrosion or tuberculation assuring durability and permanently high carrying capacity. Flexible expansion joints at every joint provide easy installation and assure permanent water tightness under all conditions of service.

• • •

The test of time has proven Lock Joint Concrete Pressure Pipe lines to be extremely economical to operate, requiring practically no maintenance or repairs throughout an estimated useful life of more than 100 years. Yet the pipe is amazingly low in initial cost.

• • •

For your next water transmission line involving pipe 16" in diameter or larger, specify Lock Joint, the capital pipe chosen by capital cities because of its durability, dependability and economy.

BOGOTA • COLOMBIA

CARACAS • VENEZUELA

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SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply Distribution Mains in a wide range of diameters as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

LOCK JOINT PIPE COMPANY

Est. 1905

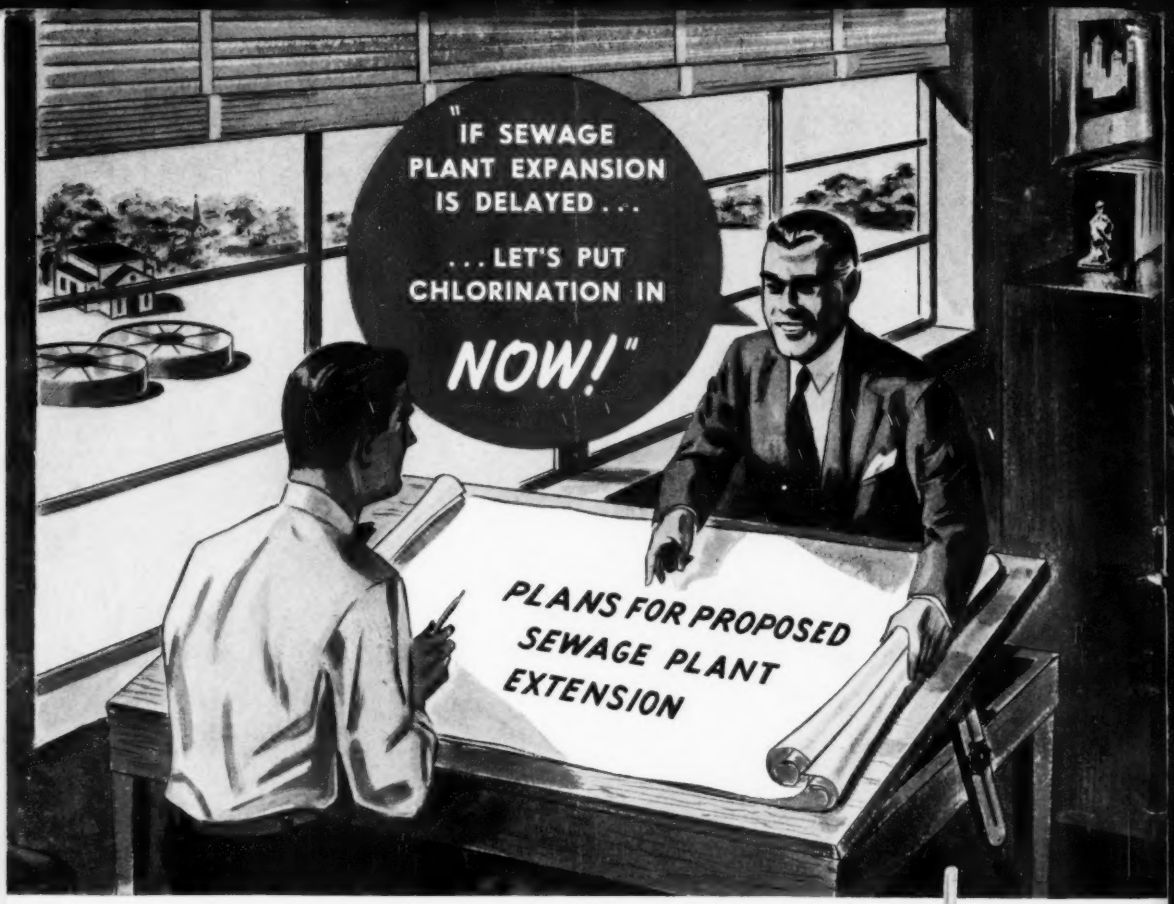
P.O. Box 269, East Orange, N. J.

PRESSURE PIPE PLANTS

Wharton, N. J., Turner, Kan., Detroit, Mich., Columbia, S. C.

BRANCH OFFICES: Casper, Wyo. • Cheyenne, Wyo. • Denver, Col. • Kansas City, Mo. • Valley Park, Mo. • Chicago, Ill. • Rock Island, Ill. • Wichita, Kan. Kenilworth, N. J. • Hartford, Conn. • Tucumcari, N. Mex. • Oklahoma City, Okla. • Tulsa, Okla. • Beloit, Wis. • Hato Rey, P. R.

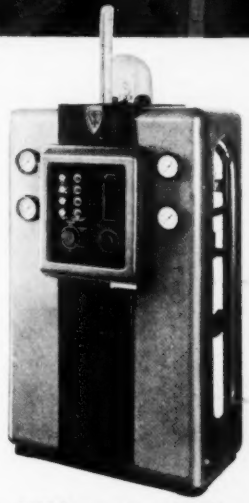
LOCK JOINT
Reinforced Concrete
PRESSURE PIPE



Expansion of an existing sewage plant, needed to meet the demands of increased population and industrial growth, may necessarily be delayed by current material shortages and building restrictions. In such a case, W&T Chlorinators can temporarily help carry the load by improving the efficiency of your present plant.

For example, overall plant efficiency can be increased when chlorine is applied ahead of and in the plant. Prechlorination ensures fresh sewage, giving better sedimentation. Plant chlorination aids grease removal, prevents filter ponding and minimizes sludge bulking. Disinfection of the effluent is ensured by post-chlorination—especially important where full treatment facilities are limited.

These are practical reasons why more and more communities are using W&T Chlorinators both to temporarily increase plant capacity and to ensure better operation of a future, expanded plant.



W&T Program Control Visible Vacuum Sewage Chlorinator

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